5-1-2022

Social and Environmental Disparities In Physical Activity and Childhood Obesity In 2-5-Year-Old Children

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SOCIAL AND ENVIRONMENTAL DISPARITIES IN PHYSICAL ACTIVITY AND CHILDHOOD OBESITY IN 2-5-YEAR-OLD CHILDREN

by

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Presented to the Faculty of the Honors College of
The University of Texas at Arlington in Partial Fulfillment
of the Requirements
for the Degree of

HONORS BACHELOR OF SCIENCE IN EXERCISE SCIENCE

THE UNIVERSITY OF TEXAS AT ARLINGTON

May 2022

ACKNOWLEDGMENTS

I would like to acknowledge my colleagues from the Movement and Physical Activity Epidemiology Laboratory who provided exceptional support and aptitude that assisted the research. Each member of the Movement and Physical Activity Epidemiology Lab has given me personal and professional advice that I will carry with me for a lifetime.

I would like to give a special thanks to Dr. Xiangli Gu, Laboratory director, for allowing me to do research within her lab and exposing me to the wonderful world of research. I would also like to show gratitude to Samantha Moss, Ph.D. candidate, for guiding me through my research journey while encouraging me to always give my best effort. I am also grateful for their insightful comments that helped me improve the paper in many ways; the errors that remain should not affect the reputation of the people mentioned.

Lastly, I would like to thank my friends and family for giving me the support and foundation to achieve my goals. Thank you to everyone for guiding me on this journey.

April 22, 2022

ABSTRACT

SOCIAL AND ENVIRONMENTAL DISPARITIES IN PHYSICAL ACTIVITY AND CHILDHOOD OBESITY IN 2-5-YEAR-OLD CHILDREN

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The University of Texas at Arlington, 2022

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Social and environmental factors are important determinants of physical activity (PA) and childhood obesity. The purposes of this study were to 1) explore associations of social-demographics (i.e., ethnicity, social-economic status [SES], gender), PA, sedentary behavior (SB), and BMI percentile with social/built environment and 2) explore SES disparities in environmental determinants of health. This cross-sectional study recruited 40 preschoolers (Mage=3.55 years; 75% girls; 17.5% low SES; 30% Hispanic; 10% overweight/obese). Parent-report surveys measured social-demographics, PA outcomes, and social/built environment. Results indicated higher SES children engaged in more PA and less SB than low-SES peers. SES significantly associated with PA, obesity, crime safety, inside space, stimulation variety, and fine and gross motor toys (r's range from -0.5

to 0.57; $p<.05$). Obesity significantly associated with inside space ($r=-.54$; $p<.05$). MANCOVA analyses revealed significant SES effects on perceived neighborhood safety and inside space toward PA ($p>.05$). Culture-specific interventions are needed among underserved children.

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CHAPTER 1

INTRODUCTION

Obesity is so prevalent today that it is considered an epidemic. It has become widespread due to unbalanced diets, technologies that encourage increased sedentary behavior, and the structure of communities that reduce physical activity (Meldrum et al., 2017). This trend could also be due to unfavorable genetic make-up and pre-existing illnesses (Wilborn et al., 2005). Centers for Disease Control defines obesity as a weight that is higher than what is considered healthy for a given height. This also supports the Body Mass Index (BMI) definition of obesity which is when an individual has a BMI over 30.0. Further, obesity according to the BMI scale is subdivided into three categories. The first class of obesity is a BMI ranging from 30-35. In class 2 of obesity, the BMI ranges from 35-to 40, and the third-class ranges from 40 or higher. There are increased health risks associated with each class. Obesity is a serious health issue because it causes and exacerbates many health problems (Browne et al., 2021). Obesity worsens conditions of diabetes, coronary heart disease, increased incidents of certain forms of cancer, respiratory issues, and osteoarthritis (Kopelman, 2000). It can lead to greater health problems later in life such as chronic inflammation, cardiovascular disease, metabolic abnormalities, depression, decreased immune response, cancer, and other metabolic conditions (Browne et al., 2021).

Obesity is an epidemic that not only impacts adults but children as well. The increasing prevalence of childhood obesity is concerning due to the increased health risks

associated with the condition. Childhood obesity tripled in U.S. children and adolescents since 1980 (Lakshman et al., 2012). According to the CDC, 1 in 5 children in the United States is obese. Studies also stated that 25% of children are overweight and 11% of children are obese in the United States (Dehghan et al., 2005). It is important to investigate weight status in children because it has been shown that 70% of obese children grow up to be obese adults (Dehghan et al., 2005).

Some children are more at risk than others when you consider their school environment, home environment, community, physical activity, ethnicity/race, gender, and even their socioeconomic status (SES). For example, research shows that if the parents are physically active, their child is almost 5.8 times more active than children with sedentary parents (Lindsay et al., 2006). Furthermore, research also shows that low socioeconomic status households and minority groups had a high prevalence of obesity (Wang, 2011). Upon analyzing the relationship between race and obesity, studies found that the prevalence of obesity is highest among blacks (48.1%), followed by Hispanics (42.5%) and then whites (34.5%) (Rosenthal et al., 2017). Several behaviors individuals within each ethnic group have that contribute to the decline in their health. There are many components besides a lack of physical activity that makes children more at risk than others for obesity.

Additionally, with this new reality of living with COVID-19, it is important to identify the social-demographic correlation related to increased childhood obesity and identify social and environmental disparities present in early childhood. Orders from the government as a response to COVID-19 mandated that families should stay at home which could encourage sedentary behavior (Castañeda-Babarro et al., 2020). These orders included the closures of schools and stores and encouraged social distancing from friends

and even family, and discouraged public gatherings (Füzéki et al., 2020). Studies have shown that since the disruption that COVID-19 has caused, preschoolers were less active (Clarke et al., 2021). Even though preschool-age children have a lower prevalence than their older counterparts, it is still important to identify the patterns associated with obesity and how that has changed since COVID-19 (Wang, 2011). To identify these patterns the purposes of this project are: 1) to explore the social-demographic correlates (i.e., ethnicity/race, socio-economic status, gender) of physical activity (i.e., sedentary behavior and moderate-vigorous physical activity) and childhood obesity (i.e., BMI) and 2) to explore the social and environmental disparities in physical activity and childhood obesity. Environmental aspects would include the child's neighborhood, community, community infrastructure, built environment, home structure, and parenting behaviors towards physical activity. This information is useful for professions centered around children and motor behavior because it can help develop efficient prevention plans, inform readers on changes in obesity trends since COVID-19, position children in a more advantageous trajectory, decrease the likelihood of future health complications, and identify populations that are at risk.

CHAPTER 2

METHODOLOGY

2.1 Demographic Information

Parents will self-report their child's date of birth, gender, and race/ethnicity. The research team will measure children's height and weight with a portable stadiometer that will be done in their classroom. Using their height and weight, body mass index [BMI] will be calculated. Parents will also self-report their household median income, marital status, education level, and zip code.

2.1.1 Home Environment

The Preschooler's Physical Activity Parenting Practices is based on a 5-point Likert scale consisting of two subscales (PPAPP; O'Connor et al., 2014). The first subscale focuses on parenting practices that encourage child activity include an engagement/structure sub-scale (15 items) and two single-items (have outdoors toys; not enrolled in sports reverse coded); and the second subscale targets parenting practices that discourage child activity include 4 subscales: promote inactive transport (3 items), promote screen time (3 items), psychological control (4 items), and safety concerns (4 items). We will also incorporate another set of questions from the Affordances in the Home Environment for Motor Development (AHEMD) (Rodrigues et al., 2005). This inventory consists of 67 items categorized into 5 subscales: outside space, inside space, variety of stimulation, fine motor toys, and gross motor toys. Parents will answer questions in these subscales in a 4-point Likert scale construct as well as description-based queries. There are

also pictorial enhancements throughout the survey to better represent the toys being asked about.

2.1.1.1 Built Environment

We will use the 17-item Physical Activity Neighborhood Environment Scale (PANES) (Sallies et al., 2010). Questions will be asked to assess perceived neighborhood infrastructure and safety (distance throughout a 15-minute walk from home) through a 4-point Likert-scale.

2.1.1.2 Physical Activity (Parent-Reported)

Parents will fill out the total time their child spent in categories including "walk for travel or for fun", "ride a bicycle or tricycle for travel or fun" and "other exercise" during weekdays (Sarker et al., 2015).

2.1.1.3 Sedentary Behavior (Parent-Reported)

Parents will record how often their child engages in selected sedentary behaviors including "On a typical weekday, how many minutes did your child spend awake in a room with (a) the television on; (b) videos or a DVD on; (c) playing on the computer; (d) playing video game consoles; (e) playing handheld devices?" Questions also include "On a typical weekday, how much time does your child spend in a stroller?" and "On a typical weekday, how much time does your child spend as a passenger in a motor vehicle? (Sarker et al., 2015)"

Data will be analyzed using SPSS version 27. A descriptive analysis and Pearson's bivariate correlation analysis to address Purpose 1. To address Purpose 2, we will conduct a multivariate analysis of covariance (MANCOVA), controlling age, gender, and ethnicity,

to test the statistical significance of social and environmental effects on physical activity and childhood obesity.

CHAPTER 3

RESULTS

This study recruited 40 children from the two childcare centers and one sports gymnasium in the North Texas area (Mage=3.55 years; 75% girls; 17.5% low SES; 30% Hispanic; 10% overweight/obese). After they signed the consent forms, the parents were given a series of validated surveys. The Preschooler's Physical Activity Parenting Practices and Affordances in the Home Environment for Motor Development surveys assessed the home environment, the Physical Activity Neighborhood Environment Scale assessed their built environment, and physical activity and sedentary behavior data were collected by the parent-reported surveys. These surveys were used to measure the study outcomes including sociodemographic, children's PA, sedentary, social, and built environment.

Results indicated children who were in higher SES families engaged in more PA (336 mins/week vs. 184 mins/week) and less sedentary behavior per week (419 mins/week vs. 476 mins/week) than the children from lower SES families in the study.

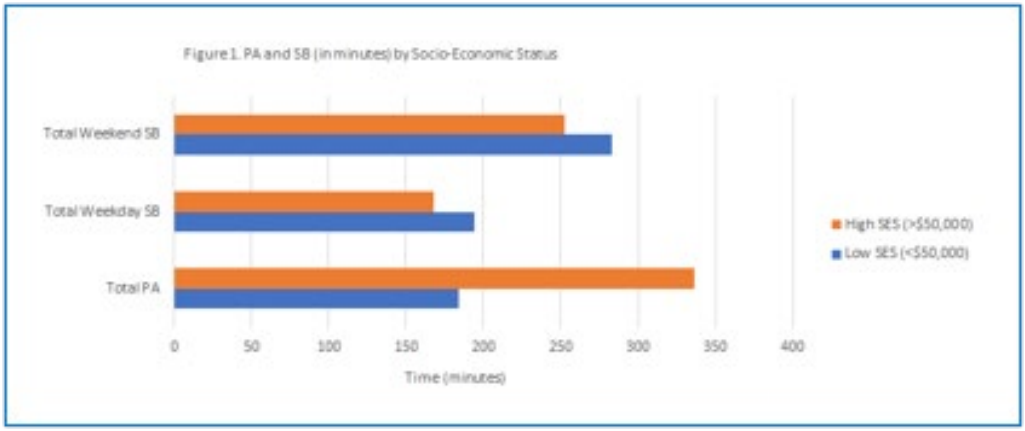
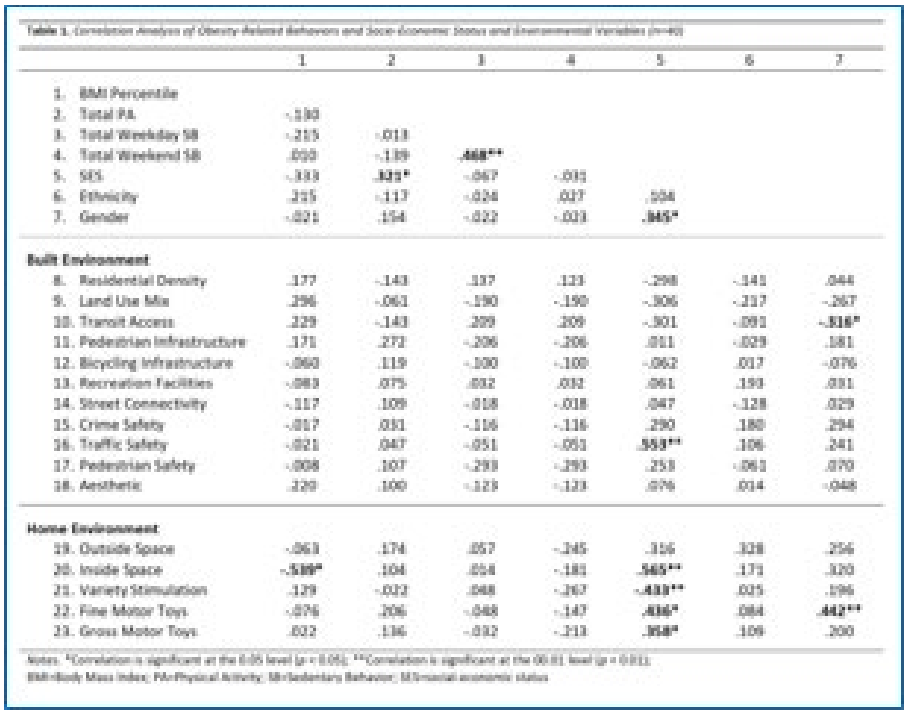


Figure 3.1: PA and SB (in minutes) by Socio-Economic Status

There were significant, moderate, and strong associations of SES with children's PA ($r=.32$; $p<.05$) and BMI percentile ($r=-.50$; $p<.05$). The results indicated that family income can impact the child's physical activity, which can further impact the child's BMI. Crime safety, inside space, variety of stimulation, and fine and gross motor toys were also significantly correlated to household income (rs ranged from -.43 - .57; $p<.05$). The safety of the community the child lived in, and the amount and type of toys they played with correlated to the parent's income. BMI percentile was negatively correlated to inside space ($r=-.54$; $p<.05$) and gross motor toys ($r=.84$; $p<.01$). If the child's BMI was on the higher end, the data showed that the household has fewer gross motor toys.



	1	2	3	4	5	6	7
1. BMI Percentile							
2. Total PA	-.180						
3. Total Weekday SB	-.215	-.013					
4. Total Weekend SB	.010	-.139	**.468****				
5. SES	-.333	**.823***	-.067	-.031			
6. Ethnicity	.215	-.117	-.024	.027	.104		
7. Gender	-.021	.154	-.022	-.023	**.845***		
Built Environment							
8. Residential Density	.177	-.143	.337	.123	-.298	-.141	.044
9. Land Use Mix	.296	-.061	-.190	-.190	-.306	-.217	-.267
10. Transit Access	.229	-.143	.209	.209	-.301	-.091	**-.816***
11. Pedestrian Infrastructure	.171	.272	-.206	-.206	.011	-.029	.181
12. Bicycling Infrastructure	-.060	.119	-.100	-.100	-.062	.017	-.076
13. Recreation Facilities	-.083	.075	.032	.032	.061	.193	.031
14. Street Connectivity	-.117	.109	-.018	-.018	.047	-.128	.029
15. Crime Safety	-.017	.031	-.116	-.116	.290	.180	.294
16. Traffic Safety	-.021	.047	-.051	-.051	**.553****	.106	.241
17. Pedestrian Safety	-.008	.107	-.293	-.293	.253	-.061	.070
18. Aesthetic	.220	.100	-.123	-.123	.076	.014	-.048
Home Environment							
19. Outside Space	-.063	.174	.057	-.245	.316	.328	.256
20. Inside Space	**-.539***	.104	.014	-.181	**.565****	.171	.320
21. Variety Stimulation	.129	-.022	.048	-.267	**-.433****	.025	.196
22. Fine Motor Toys	-.076	.206	-.048	-.147	**.816***	.084	**.442****
23. Gross Motor Toys	.022	.136	-.032	-.213	**.958***	.109	.200

Notes: *Correlation is significant at the 0.05 level (p < 0.05); **Correlation is significant at the 00.01 level (p < 0.01);
BMI=Body Mass Index; PA=Physical Activity; SB=Sedentary Behavior; SES=social economic status

Table 3.1: Correlation Analysis of Obesity-Related Behaviors and Socio-Economic Status and Environmental Variables

Further, the MANCOVA analysis revealed the significant SES effect on perceived neighborhood safety and home inside space toward child PA and development (p>.05). This data shows there was a significant relationship between the family's income and how safe they perceived their safety within that community. Data also revealed that the child's home environment can have an impact on their physical activity levels.

CHAPTER 4

DISCUSSION

The findings from Pearson's bivariate correlation analysis and multivariate analysis of covariance identified potential social and environmental correlates of early childhood obesity and sedentary behavior during the pandemic. This data found that there are numerous factors that can contribute to obesity besides the lack of physical activity, genetics, and unbalanced diets. Family income, home environment, and community can have an impact on the number of physical activity opportunities the child has. In this study, lower SES children were more sedentary and less physically active than their higher SES peers. This finding is important because physical activity correlates to BMI. The amount of physical activity and the sedentary behavior the child participates in correlates to their body weight. Lower physical activity levels are highly correlated to higher BMI. Meaning that if a child is less active, they are more likely to have a higher BMI and if the sedentary behavior is decreased, they will have a lower BMI. Higher BMI is associated with being classified as overweight or obese. This physical inactivity could contribute to the reason that high obesity rates are a general pattern within minority populations (Kumunyika, 1994).

Our data showed that families with higher SES are more active, and they have more opportunities to be physically active. The household of a high SES household has been shown to provide more resources to make healthier lifestyle choices. These resources include more toys, different types of toys, increased inside space, and safer communities.

The perceived safety of their community, the home environment, and the amount/type of toys those families had were impacted by their income.

Along with increased health issues, obesity can cause a decline in motor development. Studies have shown that obesity can cause lower quality of life, disturbed sleeping patterns, poor motor skills, less precision, poor coordination, and difficulty learning new skills (Cheng et al., 2016). Lower levels of motor performance can discourage kids from participating in daily activities and cause difficulty when learning new skills. These difficulties can cause a change in their social behavior leading to isolation (Iara Socorro Martins et al., 2021).

The many consequences of obesity represent why it is important to implement programs that give at-risk children more opportunities to be physically active. These programs can be home-based, community-based, and school-based. Home-based programs can involve a change in parenting behaviors to encourage the parents to implement activities that will help the child be more active and even make diet changes. The parents will be able to encourage the children to become more physically active and make better nutrition choices (Showell et al., 2013). Home-based programs can be more effective by targeting the parents because they are seen as the agents of change (Knowlden & Sharma, 2012). Community-based programs can also target weight-related outcomes such as PA, sedentary behavior (SB), and nutrition behaviors. Rather than focusing on parenting styles, this intervention can interact with the child more to encourage behaviors that will prevent and decrease the prevalence of obesity. School-based programs have been found to increase physical activity and even lower BMI (Kropski et al., 2008). Studies show that the combinations of interventions in different settings may be more effective for preventing

weight gain in children than just a program based in one setting (Bleich et al., 2013). The effectiveness of these programs can increase with longer intervention time periods, more intense interventions, and considering the different populations when creating these programs. These programs may be better implemented when they are presented to the children as a game. Allowing the program to increase physical activity in a way that can be engaging for children may yield better results. Additionally, presenting the information to the children in a way they can understand will help them make better decisions about their health in the future.

CHAPTER 5

CONCLUSION

As obesity becomes more prevalent it is important to identify the several factors that cause obesity and whom it affects. Not only does obesity affect adults, but research also shows that obesity impacts children. The purpose of this study was to identify the socio-demographic factors in physical activity and childhood obesity and to explore the social and environmental disparities in physical activity and childhood obesity. After analyzing the data from the surveys, this study was able to find that obesity can disproportionately affect children of different ethnicities, races, and lower household incomes. Lower SES children were found to be less physically active and more sedentary. Our findings also showed that income level may impact the opportunities conducive for PA and healthy weight in early childhood, especially within the home and social environment settings. The findings reveal there is a need for interventions for underserved children who might be more at risk for obesity due to lower household income, race, or ethnicity. To be more effective, a mixture of home-based, community-based, and school-based programs should be set in place to increase physical activity, adjust parenting styles, and encourage better nutritional behaviors. Programs that are engaging and easy to understand may be more effective when dealing with children. This increase in physical activity could decrease the prevalence of obesity in preschoolers and improve their overall health. Improving health could also improve their quality of life and decrease their chances of diseases in the future.

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BIOGRAPHICAL INFORMATION

Alexis Jones is a senior Exercise Science Major who will graduate with an Honors Bachelor of Science from The University of Texas at Arlington on May 12th, 2022. During her college career, she has been on the Dean's List four times and will graduate with Honors. She was also involved in organizations such as Black Student Association and lead as an executive board member. During her time here at UTA she has grown an interest in motor development and how it affects health. She worked on many research projects in the Movement and Physical Activity Epidemiology Lab concerning motor behavior and health. In the future, she plans to get her Doctorates in Occupational Therapy so that she can become a pediatric Occupational Therapist.