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First Generation Filipino Children and the Risk of
Childhood Obesity: Influence of Screen Time

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Abstract

Background: Obesity is an epidemic in the United States and among all Asian subgroups, Filipinos are particularly at a much higher risk. Obesity raises the risk of acquiring other health complications, especially for those who develop obesity at a younger age. Research has shown that children who engage in higher levels of screen time are more likely to become obese, resulting in screen time restrictions and recommendations. Additionally, rates of obesity are higher in immigrants. There is a gap in the explanation of screen time's effect on childhood obesity for first generation Filipino children.

Aim: The purpose of the proposed study is to determine if a daily screen time above two hours affects the development of childhood obesity in first generation Filipino children.

Methodology: This study will utilize a prospective cohort quasi-experimental design.

Recruitment Strategy: Participants will be between 6-years-old to 12-years-old, recruited from the high-density Filipino populated cities in the Bay Area.

Measurements: The independent variable will be screen time. The dependent variable will be weight. The researcher will control for: physical activity, sleep quality, diet, acculturation, first-generation immigration status, age, gender, location, income, school type, and screen time rules.

Analysis: Regression analysis followed by stepwise elimination will be used to determine the relationship between screen time and obesity while controlling for covariates.

Summary: Should this study yield significant findings, health recommendations may be promoted to help first generation Filipino youth to improve quality of life and overall health. This unique research design can be utilized for future studies involving childhood obesity.

Keywords: childhood obesity, screen time, first generation immigrant, Filipino

The prevalence of childhood and adolescent obesity in the United States is currently at an all-time high, tripling within the past three decades and creating a significant concern and public health issue (Singh et al., 2009). Childhood obesity raises the risk for many conditions that may carry throughout the individual's adulthood and later life such as type 2 diabetes mellitus, atherosclerosis, and hypertension (Kumar & Kelly, 2017). Additionally, the incidence of childhood obesity endangers the child with potential bullying and a weakened self-esteem (Kumar & Kelly, 2017).

Today, children are growing up with advanced technology and innovative gadgets including: television, computers, tablets, and mobile phones (Western Governors University, 2019). Considering the potential for frequent electronic use, the American Academy of Pediatrics (AAP) created a recommendation for children to limit their screen time to no more than two hours per day (Laurson et al., 2008). Children using these devices on a daily basis beyond the recommended parameters engage in prolonged periods of sedentary behaviors, less physical activity and irregular sleeping patterns— subsequently leading to obesity. Further increased screen time evidently leads to childhood obesity (Fang et al., 2019).

In the U.S., immigrants experience obesity at a higher risk than native-borns and this risk is the highest in Filipinos among all Asian-American subgroups (Cook & Tseng, 2019). The process of acculturation influences immigrants to adapt to unhealthy eating patterns and behaviors, which are both important contributors to obesity (Singh et al., 2009). Several factors may contribute to this difference: acculturation to American norms, lack of parental education, unhealthy lifestyle behaviors, and increased screen time (Singh et al., 2009). However, there is not enough information explaining the specific causative factors as to why first generation Filipino children are at high risk for obesity in the United States (Cook & Tseng, 2019).

Purpose

The purpose of the proposed study is to determine if a daily screen time above two hours affects the development of childhood obesity in first generation Filipino children.

Literature Review and Critique

Databases utilized for this literature search include: Cochrane Collection Plus, Health Source Nursing/Academic Edition, Nursing & Allied Health Premium, Proquest Nursing and Allied Health Source, PubMed, ScienceDirect, and Wiley Online Library. The following search terms were used on each database: childhood obesity, screen time, immigrant, acculturation, effect of screen time, physical activity, etc. For eligibility to be included in this literature critique, studies must have demonstrated significant findings related to the purpose of this study. Systematic reviews and secondary data studies were not included in this critique.

Screen time limitations are proven effective

Laurson et al. (2008) conducted a study among elementary school children to observe the combined influence of different screen time and physical activity interventions on reducing the risk of childhood overweight/obesity. A sample of 709 children were involved in this cross-sectional observational study. The independent variables were screen time (ST) and physical activity (PT). The dependent variable was body mass index (BMI). The researchers controlled for gender and the type of device (television or video games) contributing to total screen time.

Participants were required to self-report ST during specific times throughout the day for both a typical school day and a typical weekend day. This allowed for a weekly estimate, assuming that schedules differ between school days and weekend days. PA was measured through pedometer use. Participants were required to wear the pedometer for at least 10 hours on

at least 4 days, including both school days and weekend days. Documentation of the times the pedometer was worn as well as number of steps were also self-reported.

The researchers found that the relationships between ST and BMI ($r = 0.13$) and PA and BMI ($r = 0.29$) for girls were not significant. Similarly, the relationships between ST and BMI ($r = 0.22$) and PA and BMI ($r = 0.25$) for boys were not significant. The researchers found that the chance of overweight/obesity slightly increased if the individual did not meet the screen time recommendation, even if they were still engaging in the recommended amount of physical activity (boys: OR = 1.59, girls: OR = 1.32). This risk increased even more if the individual failed to meet both recommendations (boys: OR = 4.39, girls: OR = 3.00). This research suggests that screen time limitations are effective in reducing the risk of obesity and physical activity and screen time have a combined influence on its occurrence.

Limitations of this study include the self-reported data collection method and cross-sectional study design. Participants may self-report screen time and physical activity dishonestly, so an objective data measurement method would provide more reliable results. Rather than a cross-sectional study design, a prospective cohort design would be more effective in predicting the long-term risks of failing to adhere to the ST and PA recommendations.

Combining destructive behaviors increases risk

Laurson et al. (2014) conducted a study among children to observe the combined influence of screen time, sleep duration, and physical activity on childhood overweight and obesity. A sample of 674 children were involved in this cross-sectional observational study. The independent variables were screen time (ST), sleep duration (SLP), and physical activity (PA). The dependent variable was body mass index (BMI). The researchers controlled for gender, age, height, leg length, and ethnicity.

BMI was obtained and categorized among normal weight, overweight, or obese. To account for PA, participants were instructed to wear step-counting pedometers over a 7-day period. Participants self-reported daily screen time and sleep duration. For these variables, the children were asked when they wake up, go to bed, and how much time they spend on television or video games—both on the weekend and weekdays.

The researchers found that if children were not following one of the health recommendations, they were more than two times more likely to become overweight (OR = 2.6; 95% CI = 1.1, 6.5). If the child failed to meet two of the health recommendations, they were more than four times more likely to become overweight (OR = 4.7; 95% CI = 1.9, 11.3). Finally, if the child failed to meet all three of the health recommendations, they were more than eight times more likely to become overweight (OR = 8.2; 95% CI = 3.2, 21.2). This research suggests that it is more effective to promote screen time, sleep duration, and physical activity as combined influences rather than targeting them individually.

Limitations of this study include the self-reported data collection method and cross-sectional study design. Participants may provide false, dishonest information via self-reporting. Rather than self-reported wake and sleep times, an automated device could be used at the bedside to record overall sleep quality objectively.

High screen time duration decreases physical activity

Venetsanou et al. (2019) conducted a study among kindergarteners attending public schools in Greece to observe the trends of physical activity in Greek preschool children from 2005-2017, the relationship between physical activity, body mass index, and screen time, and the differences in physical activity patterns between boys and girls. A sample of 973 preschool-aged children participated in this multi-cohort cross-sectional study. The independent variables were

screen time (ST) and body mass index (BMI). The dependent variable was physical activity (PA). The researchers controlled for gender, and the cohort's year (2005, 2008, 2011, 2014, or 2017). Values for BMI, ST, and PA were obtained every three years.

The researchers found that the children who had a daily screen time of less than 1 hour had higher average daily steps than those who had 1-2 hours/day ($MD = 2941.78, p < 0.001$) and greater than 2 hours/day ($MD = 2941.78, p < 0.001$). This research suggests that high screen time duration decreases physical activity.

Limitations of this study include the self-reported data collection method of screen time, no measurement of parenting rules around screen time, and the pedometer's accuracy of measuring the intensity and types of physical activity. Participants may provide false, dishonest information via self-reporting. Screen time should be collected automatically and objectively. The researchers identified parents' parenting style and rules around screen time as important variables to be considered in future research. Pedometers may objectively measure step counts, however, do not record intensity or type of physical activity. A Fitbit device may be used to observe exercise intensity by recording heart rate activity and allowing the participant to classify their exercise type before each workout/play session.

Acculturation affects obesity in immigrants

Gee et al. (2019) conducted a study among Filipino migrants and non-migrants to test four hypotheses: 1) Filipinos will demonstrate some level of pre-acculturation prior to migration, 2) pre-acculturation will be more prevalent in Filipinos who plan to emigrate, 3) pre-acculturation increases the risk for obesity, and 4) the relationship between pre-acculturation and obesity will be different between migrants and non-migrants. A sample of 1,637 Filipinos participated in this dual-cohort longitudinal transnational study. The first cohort consisted of 832

Filipinos who were planning on migrating to the U.S. The second cohort consisted of 805 non-migrant Filipinos who resided in the Philippines and were not planning on migrating to the U.S. The independent variable was immigration status. The dependent variables were body mass index (BMI), waist circumference (WC), waist-to-height-ratio (WHtR), and waist-to-hip-ratio (WHR). The researchers controlled for gender, age, education, financial strain, diet, physical activity, English proficiency, pre-migration preparation, and pre-acculturation.

Baseline data was collected in 2017 and post-test data was collected in 2019. Variables such as BMI, WC, WHtR, and WHR were measured by trained staff members. The remaining variables were collected via self-reported demographic questionnaires and index surveys.

The researchers found that pre-acculturation is related to obesity risk, since those who were preparing for migration had a higher BMI ($SE = 0.554$), WC (1.546), and WHtR ($SE = 0.012$). The p -value for all three variables' relationships were $p \leq 0.001$, demonstrating a significant relationship. Though there is a gap in the research to explain higher rates of obesity in Filipinos, it is important to measure and control for pre-acculturation/acculturation when conducting a study related to obesity in immigrants, since this research suggests that immigrants may be affected by other factors beyond screen time.

Limitations and Gaps in the Literature Reviewed

The literature reviewed revealed that childhood obesity is a result of an interaction between multiple variables. Screen time is important to consider, as well as physical activity and sleep. For research directed toward the Filipino first-generation population, the variable of acculturation may also be valuable to include. Studies reviewed were limited by self-reported data and did not utilize a prospective cohort study. This study will utilize objective measures of

data collection and will aim to fill the gap in research for Filipino first generation children with obesity.

Theoretical Framework

The development of obesity stems beyond pathophysiological etiology and includes the interactions between social influences, environmental impacts, and psychological processes (Reed et al., 2011). In 2011, the ecological model of childhood overweight was enhanced by Reed et al. to include more potential contributors. This theoretical framework utilizes the ecological systems theory (EST). Ecological influences on the child's weight status include: child characteristics, child risk factors, parenting styles, family characteristics, in utero influences, community, demographic, and societal characteristics (Reed et al., 2011). This framework suggests that children can become more or less susceptible to obesity depending on their surrounding environment and social context, not only their biological processes or metabolism (Davison & Birch, 2001).

The proposed study explores the social context of first generation Filipino children in the U.S. and how the EST model applies to the occurrence of childhood obesity in this population. Acculturation is the process in which immigrants adopt the native-born's values, beliefs, and lifestyle characteristics (Singh et al., 2009). Prior to moving to America, immigrants adhered to much healthier dietary eating patterns than native-borns in the U.S. However, once they migrated, the process of acculturation led them to consume greater amounts of fast food and less fruits and vegetables (Singh et al., 2009). Among all the Asian ethnic groups, Filipino children displayed the most obesogenic dietary practices (Cook & Tseng, 2019). Immigrants displayed more behaviors of acculturation the longer their residence in the U.S. (Singh et al., 2009). First

generation children may be at an increased risk for unhealthy lifestyles compared to their migrant parents, as children try to “fit in” with their peers by adopting their behaviors.

Methods

The proposed study will use a prospective cohort quasi-experimental design to determine if limiting screen time affects the development of childhood obesity in first generation Filipino children.

Site and Sample

A random stratified sample of Filipino school-aged children will be recruited from high-density Filipino populated cities in the Bay Area: Daly City, Union City, South San Francisco, and Milpitas. Inclusion criteria will require the participants to be of $\geq 50\%$ Filipino ethnicity and between the ages of 6 and 12-years-old. Exclusion criteria that will prohibit participation: lack of stable internet connection and/or Wi-Fi in the home.

Protocol

Participants will be randomly selected using a stratified sampling method. A complete list of elementary schools in California cities Daly City, Union City, South San Francisco, and Milpitas will be obtained from www.elementaryschools.org. All elementary schools in these areas will be assigned a number within their respective lists. A random number generator will be used to select 3 numbers for each city, thus resulting in 3 randomly selected elementary schools from each city. Participants will be randomly selected from these samples.

An initial contact will be made with each school board to obtain written approval. Each school board will provide demographic information of all students at the school to the researcher, so that all students of $\geq 50\%$ Filipino ethnicity will be contacted for an invitation to participate in the study. Parents and participants will be informed of the purpose, method, and risks of the

study and verbal assent and written consent will be obtained during an in-person meeting. After assent and consent are obtained, participants will be measured for pre-test body mass index (BMI). To reduce margin of error, the researcher will receive prior training in how to obtain these measurements. The participants will then be asked to complete a demographic questionnaire.

Each participant will receive an Apple Inc. iPad tablet mobile device. This device will automatically record screen time and report these values to the research at 11:59 pm PST on a daily basis. Numerical values will be collected in an automatically generated Excel spreadsheet. Children will be instructed to utilize the iPad as their main source of screen time. Rather than viewing movies and shows on television or browsing the internet on a computer, participants may utilize streaming applications and search engines on the iPad. This will centralize technology use onto one device and provide a more accurate estimation of overall screen time. A Fitbit step-tracking wrist watch device will be provided and all participants will be informed of proper use and how to wear it. The Fitbit device will automatically record daily steps and report these values to the researcher at 11:59 pm PST on a daily basis. Sleep duration and quality will also be measured by the Fitbit, recording movement and heart rate to determine sleep duration, behavior, and stages (McMullen, 2020).

The participants will proceed with their daily lifestyles for the next five years. At the end of these five years, each Apple Inc. iPad will automatically lock and display an announcement for the next steps. Participants will be required to attend another in person meeting to conclude the study. To incentivize participation in the follow-up meeting, participants will be granted permission to keep both the iPad and Fitbit for personal use, should they choose to attend. At this meeting, participants will return with their issued iPads, receive an unlock code for the device, and a post-test BMI will be measured with the same technique used during the initial contact.

The participant will complete another demographic questionnaire to identify changes in behavior/variables that may have occurred over the course of the study.

Measurement/Tools

The independent variable in this study will be screen time. Screen time will be measured as a dichotomous variable. Depending on the Apple Inc. iPad automatic recorded screen time, participants will be categorized into a control group (≤ 2 hours/day) and an experimental group (> 2 hours/day). The dependent variable will be body mass index (BMI), which will be categorized according to growth charts from the Center for Disease Control and Prevention (CDC), taking into account each participant's age and gender. BMI will be classified as underweight, healthy, overweight, or obese.

The following covariates will be controlled for through the administered demographic questionnaire: first-generation immigration status, age, gender, location, income, school type, and screen time rules. Immigration status will be a dichotomous variable, whereas if ≥ 1 parent was born in the Philippines and immigrated to the U.S. or not. Age will be ordinal and separated by early school age (6-9) and late school age (10-12). Gender will be categorical between female or male. Location will be determined by geographical location of residence within the Bay Area: Daly City, Union City, South San Francisco, or Milpitas. Household income per year will include four ordinal categories: $< 60,000$, $60,000 - 69,999$, $70,000 - 79,999$, or $\geq 80,000$. School type will be categorical, depending on the type of school the participant is enrolled— non-religious private, religious private, or public. Parents will be asked, “How often do you enforce screen time limitations?” Screen time rules will include five ordinal categories: never (1), rarely (2), sometimes (3), often (4), and always (5).

Physical activity, sleep quality, diet, and acculturation are covariates that will not be measured via demographic questionnaire. Physical activity (PA) will be measured by the provided Fitbit step-tracking wrist watch devices. PA will be a dichotomous variable, categorized between “meets recommendations” and “does not meet recommendations.” Recommendations from the President’s Challenge and Physical Activity and Fitness Awards program will be applied respectively of gender: boys are recommended $\geq 13,000$ steps/day and girls are recommended $\geq 11,000$ steps/day. Sleep quality will be measured using the Fitbit wrist device, reporting a Fitbit sleep score. The variable will be ordinal among the following categories: poor quality (< 60), fair quality (60-79), good quality (80-89), and excellent quality (90-100). Diet will be measured using the food habits questionnaire (FHQ) developed by Kristal et al. (1990). The FHQ consists of 20 items within a self-report questionnaire, observing typical dietary habits over the past month. The Likert scale ranges from 1 “Never or Rarely” to 4 “Usually or Always,” or “Not applicable”. FHQ test-retest reliability ($r = 0.74$) was measured across a nine month period (Kristal et al., 1990). Acculturation will be measured using a short acculturation scale for Filipino Americans (ASASFA) developed by Dela Cruz et al. (2000). The ASASFA is a 12-item questionnaire that measures language use and preference at work, at home, and with friends, language use and preference in media programs, and preferred ethnicity of individuals in social relations (Dela Cruz et al., 2000). Mean total acculturation demonstrated a correlation of 0.85 ($p < 0.001$) and the Cronbach’s alpha coefficient for internal consistency was 0.85 (Dela Cruz et al., 2000).

Analysis

For all variables within the sample, means and standard deviations will be calculated with the initial numerical values reported on screen time, body mass index, age, income, sleep quality,

diet, and acculturation. Proportions will then be calculated for the same variables, as well as first-generation immigration status, gender, location, school type, and physical activity. Statistically significant differences between participants with an average screen time ≥ 2 hours/day and those with an average screen time < 2 hours/day will be determined using *t*-tests (screen time, body mass index, age, income, sleep quality, diet, and acculturation) and Chi-squared tests (screen time rules, first-generation immigration status, gender, location, school type, and physical activity).

The relationship between screen time and obesity will be tested using regression analysis, controlling for each covariate. After conducting the regression analysis, significant covariates will be identified and a multiple linear regression will be performed with a stepwise elimination method to determine if the relationship between screen time and obesity still remains significant.

Human Subject Protection

Human subject oversight will be provided by the Dominican University of California IRB. Participants will be children aged 6-12 years old, so verbal assent will be required to protect their safety. Children are not at the age of consent, so consent will also be required from parents.

Parents and children should be informed that the extensive use of mobile devices is a risk factor for participation in this study. Receiving an iPad could result in an increase in screen time above a child's usual baseline. Should any of the following occur, the participant may withdraw from the study: the parent observes that their child is experiencing a detrimental overexposure to screen time, the child is experiencing unhealthy physical and/or psychological disturbances, the child is experiencing distress from constant use of the devices, and both the parent and child wish to withdraw.

Throughout the study, participants' names will not be used in association with the data and all data will be kept confidential. Each participant will be assigned a number, which will also correspond to their completed paperwork, iPad, and Fitbit.

Limitations

Participants will only be recruited from cities in the California Bay Area, so this study may lack a large, nationally representative sample. Participants will be instructed to use the iPad as their main device, however, should the participants use other devices, screen time will otherwise not be recorded. This might affect the accuracy of each participant's screen time values. There will be difficulty in monitoring proper use of the issued devices throughout the duration of the study. Although each participant will be informed on how to correctly wear the Fitbit, it is likely that the participants will not wear the wrist device every single day of the study. This may result in unintended variability in the data.

However, this study will still add valuable data if a significant relationship is found between screen time and childhood obesity for first generation Filipino children. Previous research reveals that Filipinos experience obesity at a higher rate than most ethnic groups. This study will be the first research design to closely observe Filipino children, their screen habits, and weight status while also considering unique variables such as acculturation and immigration status. Findings from this study can contribute to future research dedicated to reducing the incidence of childhood obesity.

Conclusion

The proposed study will use a prospective cohort quasi-experimental design to determine the effects of screen time on the development of childhood obesity in first generation Filipino children. The findings of this research will guide healthcare professionals in implementing

effective preventative strategies for childhood obesity from a more holistic framework.

Filipino-Americans are a minority group in the U.S. and face health disparities, obesity being one of the most prevalent. If this study yields significant findings, health recommendations may be promoted to help first generation Filipino youth to improve quality of life and overall health.

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Table 1: Screen time limitations are proven effective

Citation	Design Purpose	Sample Setting	Independent Variable	Dependent Variable	Significant Findings	Notes
Laurson et al. 2008	<p>Cross-sectional observational study</p> <p>The purpose was to observe the combined influence of different screen-time/physical activity interventions on reducing the risk of childhood overweight/obesity.</p>	<p>709 children</p> <p>Children were selected from four different public elementary schools in Lakeville, Minnesota and Cedar Rapids, Iowa. All children were involved in a community-based childhood overweight and obesity intervention known as SWITCH. The individuals were then randomized into the control and treatment groups.</p>	<p>IV:</p> <ul style="list-style-type: none"> • Screen time (ST) • Physical activity (PA) <p>Covariates:</p> <ul style="list-style-type: none"> • Gender • Type of device contributing to screen time (television or video games) 	<p>DV:</p> <ul style="list-style-type: none"> • Weight 	<ul style="list-style-type: none"> • Risk for obesity increased for boys and girls (OR=4.39 and 3.00) if both recommendations were not met. • Risk for obesity was not as high if PA was still met despite ST not being met (OR=1.59 and 1.32). • The relationships between ST and BMI ($r=0.13$) and PA and BMI ($r=-0.29$) for girls were not significant. • The relationships between ST and BMI ($r=0.22$) and PA and BMI ($r=-0.25$) for boys were not significant. 	<ul style="list-style-type: none"> • Screen time increases the risk of childhood obesity. • Physical activity and screen time have a combined influence on the incidence of obesity. • All data was self-reported. Participants were responsible for reporting daily screen time and adherence to wearing the pedometer to record physical activity. • A prospective cohort design would be more effective in explaining the future risk of these habits.

Table 2: Combining destructive behaviors increases risk

Citation	Design Purpose	Sample Setting	Independent Variable	Dependent Variable	Significant Findings	Notes
Laurson et al. 2014	<p>Cross-sectional observational study</p> <p>The purpose was to observe the combined influence of screen time, sleep duration, and physical activity on childhood overweight and obesity.</p>	<p>674 children</p> <p>Children were selected from two school districts in Lakeville, Minnesota and Cedar Rapids, Iowa. All children were participating in the SWITCH childhood obesity intervention.</p>	<p>IV:</p> <ul style="list-style-type: none"> • Screen time (ST) • Sleep duration (SLP) • Physical activity (PA) <p>Covariates:</p> <ul style="list-style-type: none"> • Gender • Age • Height • Leg length • Ethnicity 	<p>DV:</p> <ul style="list-style-type: none"> • Weight 	<ul style="list-style-type: none"> • The risk for overweight/obesity continues to increase as one (OR=2.6), two (OR=4.7), or all three (OR=8.2) recommendations are not met. 	<ul style="list-style-type: none"> • It is more effective to promote screen time, sleep duration, and physical activity as combined influences on obesity, rather than targeting them individually. • The cross-sectional design is not effective in determining the effect of these three variables over time. • Self-reported data weakened the reliability of the data. Objective data measurement should be considered in future research designs.

Table 3: High screen time duration decreases physical activity

Citation	Design Purpose	Sample Setting	Independent Variable	Dependent Variable	Significant Findings	Notes
Venetsanou et al. 2019	<p>Multi-cohort cross-sectional study</p> <p>The study included three purposes. (1) To observe the trends of physical activity in Greek pre-school children from 2005-2017 (2) To observe the relationship between physical activity, body mass index, and screen time (3) To observe the differences in physical activity patterns between boys and girls</p>	<p>973 children</p> <p>The researchers recruited participants from different public kindergartens in Greece.</p>	<p>IV:</p> <ul style="list-style-type: none"> • Screen time (ST) • Body mass index (BMI) <p>Covariates:</p> <ul style="list-style-type: none"> • Gender • Cohort (year) 	<p>DV:</p> <ul style="list-style-type: none"> • Physical activity (PA) 	<ul style="list-style-type: none"> • Children who had a daily screen time of < 1 hour had higher average daily steps than those who had 1-2 hours/day (MD = 2941.78, $p < 0.001$) and > 2 hours/day (MD = 2941.78, $p < 0.001$). 	<ul style="list-style-type: none"> • High screen time duration decreases physical activity. • Limitations: self-reported screen time, did not consider parental rules around using technology, pedometer did not measure the intensity or type of physical activity.

Table 4: Acculturation affects obesity in immigrants

Citation	Design Purpose	Sample Setting	Independent Variable	Dependent Variable	Significant Findings	Notes
Gee et al. 2019	<p>Dual-cohort longitudinal transnational study</p> <p>The study included four hypotheses. (1) Filipinos will demonstrate some level of pre-acculturation prior to migration (2) Pre-acculturation will be more prevalent in Filipinos who plan to emigrate (3) Pre-acculturation increases the risk for obesity (4) The relationship between pre-acculturation and obesity will be different between migrants and non-migrants</p>	<p>Cohort 1: 832 Filipinos migrating to the U.S. Cohort 2: 805 non-migrant Filipinos in the Philippines</p> <p>The researchers recruited participants from potential migrants participating in a Pre-Departure Orientation Seminar (PDOS) hosted in the Philippines.</p>	<p>IV:</p> <ul style="list-style-type: none"> • Immigration status <p>Covariates:</p> <ul style="list-style-type: none"> • Gender • Age • Education • Financial strain • Diet • Physical activity • English proficiency • Pre-migration preparation • Pre-acculturation 	<p>DV:</p> <ul style="list-style-type: none"> • Body mass index (BMI) • Waist circumference (WC) • Waist-to-Height-Ratio (WHtR) • Waist-to-Hip-Ratio (WHR) 	<ul style="list-style-type: none"> • Pre-acculturation is related to obesity risk, since those who were preparing for migration had higher BMI (SE = 0.554), WC (SE = 1.546), and WHtR (SE = 0.012). $p \leq 0.001$ for all three variables, demonstrating a significant relationship. 	<ul style="list-style-type: none"> • For the proposed study, it is important to control for other factors, especially acculturation or pre-acculturation, since screen time may not be the only influence on overweight/obesity for first-generation Filipino children. • Diet and physical activity were self-reported, again not providing strong accuracy.

Table 5: Study Variables

Variable	Definition	Type	Measure	Notes
<i>Exposure / Independent Variable</i>				
Screen Time	Time spent on a mobile device per day	Dichotomous: ≤ 2 hours/day > 2 hours/day	Apple Inc. iPad automatic screen time recorder	According to American Academy of Pediatrics (AAP) recommendations
<i>Outcome / Dependent Variable</i>				
Body Mass Index	An individual's weight in kilograms divided by the square of height in meters	Categorical: Underweight Healthy Overweight Obese	Based on corresponding measured BMI with percentile on CDC growth chart	BMI is age and sex specific
<i>Co-Variates / Others</i>				
First-Generation Immigration Status	U.S. born citizen and ≥1 parent was born in the Philippines and immigrated to the U.S.	Dichotomous: Yes No	Demographic questionnaire	
Age	Years of age	Ordinal: Early school age (6-9) Late school age (10-12)	Demographic questionnaire	
Gender	Reported gender and/or sex	Categorical: Female Male	Demographic questionnaire	
Location	Geographical location of residence in the Bay Area, CA	Categorical: Daly City Union City South San Francisco Milpitas	Demographic questionnaire	
Income	Household income per year	Ordinal: < 60,000 60,000 - 69,999 70, 000 - 79,999 ≥ 80,000	Demographic questionnaire	
School Type	Classification of school education system	Categorical: Non-religious Private Religious Private Public	Demographic questionnaire	

Screen Time Rules	Parental discipline around limiting daily screen time	Ordinal: Never (1) Rarely (2) Sometimes (3) Often (4) Always (5)	Demographic questionnaire	This Likert Scale question will ask the parent, “How often do you enforce screen time limitations?”
Physical Activity	Time spent engaging in moderate and vigorous exercise	Dichotomous: Meets recommendations Does not meet recommendations	Fitbit	According to President’s Challenge Physical Activity and Fitness Awards Program Boys: ≥ 13,000 steps/day Girls: ≥ 11,000 steps/day
Sleep Quality	Duration of time spent in the restorative stage of sleep per night	Ordinal: Poor (<60) Fair (60-79) Good (80-89) Excellent (90-100)	Fitbit	Number ranges are based on the Fitbit “sleep score”
Diet	Average dietary habits and food preferences		Food Habits Questionnaire (FHQ)	$r = 0.74$
Acculturation	The process in which immigrants adopt the native-born’s values, beliefs, and lifestyle characteristics		A Short Acculturation Scale for Filipino Americans (ASASFA)	$r = 0.85$ $p\text{-value} < 0.001$ Cronbach’s $\alpha = 0.85$

Figure 1: Theoretical Framework

Based on expanded version of Davison & Birch (2001), enhanced by Reed et al, 2011. *Obesity in Rural Youth: Looking Beyond Nutrition and Physical Activity*. JNE Vol.43, No. 5, Pg. 403.