Peruvian Parents Perceptions of Children's Obesity

Kathleen McInvale Trejo[1,2,3] and Mary Shaw-Ridley[4]

[1]*Department of Health and Human Performance, College of Charleston*
[2]*Centro de Excelencia en Enfermedades Crónicas, Universidad Peruana Cayetano Heredia*
[3]*Department of Epidemiology, Florida International University*
[4]*Department of Behavioral and Environmental Health, Jackson State University*

Abstract

Background and Purpose: Although parents are critical to childhood obesity prevention, little is known about Peruvian parents' perceptions regarding childhood obesity, a country undergoing an emerging obesity epidemic. The study assessed Peruvian parents' perceptions regarding their children's obesity risks and behaviors. The specific objectives were to: (a) assess the knowledge, attitudes, and behaviors of parents regarding nutrition and physical activity of their preschool-aged children, and (b) assess parents' ability to recognize overweight status in their children. **Methods:** The cross-sectional study surveyed 202 parents of preschool children (Mean age= 49.4 months, SD = 8.5) in the peri-urban slum communities of Lima, Peru utilizing a modified version of the Behavior and Attitudes Questionnaire for Healthy Habits (BAQ-HH). Children's body mass index (BMI) was compared with parental descriptions of the child's weight. **Results:** Nearly half (41.3%) of children had exceeded healthy weight (defined as BMI- for-age Z- score >-2 and ≤1). Parents demonstrated high knowledge, positive behaviors, and concerned attitudes. Parental knowledge and attitude scores predicted parental behavior scores (p=0.004). More than half (56.6%) accurately perceived their child's weight. However, 90.4% of parents of overweight/obese children underestimated their weight. **Conclusions:** Understanding Peruvian parents' perceptions of their children's obesity risk is essential to planning comprehensive interventions.

Background

The obesity epidemic is a global health crisis. In just the thirty-year span between 1980 and 2010, the worldwide prevalence of obesity doubled (Perez Rodrigo, 2013). The excess weight problem affects people across the lifespan, particularly within developing countries (Popkin & Gordon-Larsen, 2004). In Latin America, obesity and related chronic diseases have become one of the most important public health concerns (The Lancet Diabetes, 2014). Since 1980, the average body mass index (BMI) of a Latin-American individual has increased each decade at rates double the global average (The Lancet Diabetes, 2014). Obesity is an issue even among children in the region, with twenty percent of children in the region being overweight or obese (The Lancet Diabetes, 2014).

Overweight and Obesity Status in Peru
Peru is one such Latin American country with an emerging obesity epidemic (Loret de Mola, Quispe, Valle, & Poterico, 2014). Urbanization and globalization have contributed to changes in dietary habits, an increase in sedentary lifestyles, and decreased physical activity among Peruvians living in the capital city of Lima and urbanized coastal regions (Loret de Mola et al., 2014). Similar to adults, the excess weight problem is increasing most rapidly even among the

youngest urban-dwelling Peruvian children with more than 14 percent of children under five living in Lima and the surrounding urban areas being overweight or obese (Torres-Roman, Urrunaga-Pastor, Avilez, Helguero-Santin, & Malaga, 2018). Although wealth is usually considered to be a risk factor for excess weight in low and middle-income countries, emerging research indicates that the rates of overweight and obesity among children living in resource-poor settings in Latin America are increasing faster than children of other SES strata (Hernandez-Vasquez, Bendezu-Quispe, Santero, & Azanedo, 2016). This may suggest that urban-dwelling Peruvian children in poor communities may be at a particularly high risk for obesity and overweight (Hernandez-Vasquez et al., 2016).

Parental Involvement in Obesity Prevention
Parental involvement is critical for childhood obesity interventions. Parents have been identified as one of the strongest predictors of obesity and overweight in their children (Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003). They serve as role models of nutrition, physical activity, and sedentary behaviors for their preschool-aged children (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000). Additionally, they largely control opportunities for obesity preventive behaviors like physical activity and healthy eating from which children adopt lifelong habits (Baughcum et al., 2000). These parental influences, however, may vary among racial and ethnic groups (Lora, Cheney, & Branscum, 2017; Showell et al., 2017). Further research is needed to understand cultural variations in parental influences and how differences in these influences may contribute to the physical activity and nutrition behaviors in preschool-aged populations with emerging obesity epidemics. Moreover, to effectively engage parents in obesity intervention efforts, parents must first perceive their overweight or obese child as being as such and recognize this as a health risk (Eckstein et al., 2006). This ability may be subject to cultural variations, such as values or preferences for heavier children (Lindsay, Sussner, Greaney, &

Peterson, 2011; Silveira, Colugnati, Poblacion, & Taddei, 2015). This, however, has not been studied among Peruvian parents of young children.

The Present Study
The purpose of the study was to assess Peruvian parents' perceptions regarding their children's obesity risks and obesity-related behaviors. The specific objectives were to (a) assess the knowledge, attitudes, and behaviors (KABs) of parents regarding nutrition and physical activity behaviors of their preschool-aged children; (b) and assess their ability to determine if their children are overweight. While the study is exploratory in nature, we hypothesized that parental perceptions might be associated with parental behaviors and skills, so we investigated the following additional research questions (a) are parental attitudes and knowledge regarding their child's nutrition and physical activity related to parental behaviors, and (b) are parental attitudes and knowledge related to their ability to accurately identify their child's weight status?

Methods
Study Design
The study was a cross-sectional survey of parents of preschool children in the communities of southern Lima, Peru. Participating parents were recruited at the school site and responded to survey questions aimed at assessing their perceptions of children's obesity risks and obesity-related behaviors. Researchers used a modified version of the Behavior and Attitudes Questionnaire for Healthy Habits (BAQ-HH) (Henry, Smith, & Ahmad, 2014). Additional items to assess children's obesity risks were included in the modified instrument, and the clinically measured BMI data of the children were collected from school health records and compared with parental survey responses.

Participants
The study was comprised of 202 parents of three and four-year-old children attending five preschools in Villa Maria del Triunfo and San

Juan de Miraflores. The communities where the study was conducted are peri-urban slum neighborhoods located in the southern cone of the Lima metropolitan area (Lima Sur). According to the Peruvian government's Instituto Nacional de Estadistica e Informatica (INEI), these communities, which are known locally as *pueblos jovenes* or young neighborhoods, are comprised of more than 750,000 residents (INEI, 2017). They were originally established by immigrants from other areas of Peru moving into Lima to flee terrorism and in search of better living conditions during later decades of the twentieth century (Weygandt et al., 2012). These communities are characterized as being comprised of informal, unfinished housing structures with many homes lacking indoor plumbing and running water (Weygandt et al., 2012). Residents of the neighborhoods have limited higher education and are living at the national poverty level, typically earning a monthly income equal to the national minimum wage (Weygandt et al., 2012).

Parents who were at least 18 years of age, spoke and read in Spanish, and had a three- or a four-year-old preschool child attending one of the participating school sites were invited for participation. Convenience sampling was used to recruit study participants. G* Power analysis indicated that the study sample of 200 parents, utilizing a medium effect size, yielded a study power of 0.92 (Faul, Erdfelder, Lang, & Buchner, 2007).

Measures
Two instruments were used to collect data for the study. The first instrument was a modified version of a previously utilized survey. The second instrument was a researcher developed record form used to collect child health metrics. The survey instrument was a modified version of the Behavior and Attitudes Questionnaire for Healthy Habits (BAQ-HH) (Henry et al., 2014). It included a total of 39 items. The BAQ-HH assessed three dimensions; parental KABs regarding their child's nutrition and physical

activity behaviors over 22 questions and included five additional demographic items. Survey items within the knowledge dimension assessed the parent's general understanding of the causes and prevention of childhood obesity, and included specific items addressing parental knowledge of appropriate portions sizes for their child, recommended amounts of sugar and fat in children's diet, and knowledge regarding the type and time of appropriate physical activities (Henry et al., 2014). The attitude dimension assessed the level of concern parents expressed about their ability to change their child's obesity preventive behaviors. This dimension included items regarding parents' perceived barriers to engaging in healthy behaviors and their feelings of concern about promoting diet and physical activity (Henry et al., 2014). Finally, the behavior dimension assessed the parent's behaviors regarding their child's diet and physical activity level. The dimension included questions asking about the type and timing of the food they serve, and if they prompt their child to be active (Henry et al., 2014).

Parents indicated their level of agreement with statements within each of these dimensions on a Likert scale ranging from one, strongly disagree, to six, strongly agree. Higher mean scores on the knowledge and behavior scales indicated positive knowledge and healthier behaviors, while higher mean scores on the attitude scale indicated more concerned or unhealthy attitudes (Henry et al., 2014). Parental knowledge and attitude scores were examined as predictors of parental behavior scores.

The BAQ-HH also included seven items assessing the frequency of children's behaviors that have been shown to contribute to childhood obesity known as Rao's Big Five, including their sugary beverage consumption, physical activity level, screen time, fast food consumption and shared mealtime with parents (Rao, 2008). Further details about the BAQ-HH, including information about the development, validation, and scoring as well as a full description of the questions within each dimension, have been

published elsewhere (Henry et al., 2014). Based on preliminary pilot testing, minor modifications were made to the language of the survey and demographic questions to be culturally appropriate for the Peruvian population.

Additional items were included in the survey instrument to capture more information about the Peruvian parents' perceptions regarding their children's obesity risks. Two items, previously utilized in other studies, were used to assess parental ability to correctly qualify their child's weight status via a series of images and verbal descriptions (Baughcum et al., 2000; Eckstein et al., 2006; Gauthier & Gance-Cleveland, 2016). Verbal descriptors have been widely used to assess parental ability to identify their child's weight status. However, research indicates that parents of overweight or slightly overweight children might be able to better identify their child's weight status using images rather than verbal descriptors (Eckstein et al., 2006). Images were drawn from the 2006 study by Eckstein and colleagues (Eckstein et al., 2006). Parents' KABs were examined as predictors of their ability to accurately identify their child's weight status.

Finally, three additional questions identifying the type of information parents were receiving about overweight and obesity prevention were added to the instrument. The questions sought to identify potential resources and education efforts within the community. Parents were asked to identify whether they were receiving any information about healthy eating and physical activity for their children and families. If parents responded affirmatively, they were asked to identify the source of information and evaluate if it helped them to make healthy decisions for themselves and their families.

A researcher developed form was used to extract and record BMI data from school health records. Children are required to receive an annual physical exam at their pediatrician's office at the beginning of each school year, and selected health data from the physical exam are provided to school administrators. The study was conducted during the school year, approximately three months after the children's height and weight were clinically measured. School administrators provided the researcher with the children's BMI relevant data (height, weight, gender, birth date, and date of physical exam) from their most recent physical exam. Children's BMIs at the time of the physical exam were calculated using the standard equation for BMI with metric measurements for children over two years of age, weight in kilograms divided by height in meters squared (Centers for Disease Control and Prevention, 2018). Children's BMIs were used to classify the child's weight status prior to data analysis. Weight status was categorized based on the World Health Organization's (WHO) Department of Nutrition for Health and Development standard classifications for children two- to five- year old using Z-Scores (World Health Organization, Department of Nutrition for Health and Development, 2008). WHO defines wasted as $\geq$ -3 and <-2 Z-Scores, healthy weight as $\geq$ -2 and $\leq$ 1 Z-Score, possible risk for being overweight >1 Z-Score and $\leq$2 Z-Scores, overweight >2 and $\leq$ 3 Z-Scores, and obese as >3 Z-Scores above average BMI-for- age (World Health Organization, Department of Nutrition for Health and Development, 2008).

To assess the parent's ability to accurately identify their child's weight status, their verbal descriptions and image selection were compared with their child's measured weight according to WHO categories. Outcome choices for each of these variables were collapsed into four response choices: underweight, healthy weight, overweight, and obese. The WHO definition of at risk of being overweight" was collapsed into the overweight" category for this analysis. Two additional variables, the first assessing agreement between parental responses using verbal descriptors and measured weight status, and the second assessing agreement between parental responses using images and measured weight status, were then created, with outcomes coded as one indicating agreement and zero

indicating disagreement. One last variable was created that classified a parent's ability to identify a child's weight status into three categories, including underestimating the child's weight, correctly identifying the child's weight, and overestimating the child's weight. The children's clinically measured weight status was examined as a predictor of the parent's ability to accurately perceive their child's weight.

Procedures

The study was approved by the human ethics committee of A.B. PRISMA, a local non-governmental public health-oriented organization that conducts research and outreach in Lima, Peru, and the Institutional Review Board at the Florida International University. Additionally, the study was approved by Peru's Ministry of Education district overseeing the schools of southern Lima. A Spanish-speaking research assistant from the Lima Sur neighborhood was trained in study protocol and research ethics considerations and assisted with all school staff and parent communication. Directors of preschools in San Juan de Miraflores and Villa Maria del Triunfo were contacted by the researcher and research assistant with information about the study and an invitation to participate. A total of six school sites recommended by the Ministry of Education were contacted. Five schools consented, three private and two public, and one school director was unavailable to meet with the researchers. Based on feedback from the local IRB, no incentives were provided for participation in the study. Letters explaining the purpose of the study and an invitation to participate were sent home with children one week before the data collection. The research team was at the school site during the data collection periods to further explain the study and invite parents to participate. Consenting parents at participating school sites were provided with the paper surveys by the researcher. Parents completed the surveys during child pick-up and drop off times and at select parent-teacher meetings. Survey completion averaged 15 minutes. Once survey data collection was completed at the school,

BMI data of participating children were extracted from school health records. Data from the completed surveys were entered into and stored in the SPSS V22.0 software program (IBM Statistics for Windows, Version 22.0) for analysis and saved as encrypted files.

Analyses

Data from the three parental scales and Rao's big five were analyzed descriptively with means, standard deviations, frequencies, and percentages. Multiple regression analysis was used to assess if parental knowledge and attitudes predicted parental behaviors. ANOVA and Tukey-Kramer post hoc analysis was used to test for differences in KAB scores by parental demographic characteristics, including their age. Agreement between the parents' classification of their children's weight status and the child's actual BMI was analyzed descriptively using frequencies. McNemar's test (McNemar, 1947) was used to determine if there was any difference in parental ability to correctly identify the child's weight status (Yes/No) by type of descriptor (verbal or image). Fisher's Exact test was used to assess if the parent's ability to correctly identify their child's weight status differed by the child's actual measured weight. Spearman's rank-order correlations were used to assess any differences in parental scores on the knowledge, attitude, and behavior BAQ-HH scales and parental ability to correctly identify their child's weight using both verbal descriptors and images. Parent's receipt of information was analyzed descriptively using frequencies. Chi-square test of independence was used to examine differences in receipt of information by school type (public or private).

Results

A total of 202 parents completed the survey. Demographic information about the parents is presented in Table 1. The majority of participants reported that they were the person primarily responsible for preparing meals for their family (n=151, 74%). Anthropometric data

were available from the schools for a total of 147 children.

Table 1.
Parent Socio-demographic Characteristics (N=202)

Variable	n (%)
Gender	
Female	179 (88.6)
Male	23 (11.4)
Age	
Less than 20	3 (1.5)
20 to 29 years	80 (39.8)
30 to 39 years	91 (45.3)
40 to 49 years	22 (10.9)
50 to 59 years	2 (1.0)
60 or more	3 (1.5)
Education	
Grade School	10 (5.0)
High School	78 (39.5)
Technical School	81 (41.1)
Some University	11 (5.5)
University	12 (6.1)
Graduate School	5 (2.5)
Knowledge Scores*	5.14 (0.70)
Attitude Scores*	4.07 (1.12)
Behavior Scores*	5.09 (0.56)

*Mean (S.D)

Table 2 presents the characteristics of the three- and four-year-old children as well as the frequency of the children's dietary and activity behaviors. More than half of the children (79.6%) consumed two or more sugar-sweetened beverages daily while fast food consumption was less frequent, with the majority (68.7%) of children consuming one or less fast food meals weekly. The majority of the children (72.7%) received less than half the recommended amount of physical activity for preschool children.

Parental Physical Activity and Nutrition Knowledge, Attitudes, and Behaviors
Peruvian parents had mean scores of 5.14 (*SD*=0.70, *n*=188) on the knowledge scale, 4.07 (*SD*=1.12, *n*=182) on the attitudes scale, and 5.09 (*SD*= 0.56, *n*=184) on the behaviors scale. No significant differences in knowledge or behavior scores were detected by parental demographic characteristics.

Table 2.
Children's Demographic Characteristics and Health Behaviors

Variable	n (%)
Age (months)*	49.4 (8.5)
Gender	
Female	79 (53.7)
Male	68 (46.3)
BMI z-score*	0.43 (1.01)
Weight Status	
Wasted	2 (1.4)
Healthy	83 (57.2)
Risk of Overweight	36 (24.8)
Overweight	17 (11.8)
Obese	7 (4.8)
School Type	
Public	101 (49.8)
Private	102 (50.2)
Sugary beverages (per day)	
One or less	40 (20.4)
Two	66 (33.7)
Three	50 (25.5)
Four	16 (8.2)
Five or more	24 (12.2)
Fast food meals (per week)	
One or less	134 (68.7)
Two	45 (23.1)
Three or more	16 (8.2)
Meals at home (daily)	
One or Two	46 (23.6)
Three or more	149 (76.4)
Days of Physical Activity	
Zero or one	48 (24.4)
Two or three	96 (48.7)
Four or five	28 (14.2)
Six or seven	25 (12.7)
Screen time (hours daily)	
Less than one	46 (23.5)
One or two	72 (36.7)
Two or three	49 (25.0)
More than three	29 (14.8)

*Mean (S.D.)

Behaviors Predicted by Knowledge or Attitudes

There was a small positive relationship between knowledge scores and behavior scores $r(177)=0.180$, $p=0.017$. There was also a small positive relationship between attitude scores and behavior scores $r(174)=0.200$, $p=0.008$. Multiple linear regression analysis determined that attitude and knowledge scores significantly predicted behavior scores, $F(2,166)=5.826$, $p=0.004$, $R^2=0.066$. However, only attitude was statistically significant ($p=0.027$) (Table 3).

Table 3.
Summary of Multiple Linear Regression Analysis for Behavior Scores

Variable	B	$S.E.$	β
Knowledge	0.123	0.066	0.146
Attitudes	0.083	0.037	0.174*

*$R^2=0.066$, $p<0.05$

Parental Ability to Identify the Child's Weight Status

A little more than half of Peruvian parents were able to correctly identify their child's weight status using images (54.2%, $n= 78$) and verbal descriptors (56.6%, $n=81$). The majority of parents of overweight and obese children underestimated their child's weight using both verbal descriptors (90.4%, 100%) and images (78.8%, 100%), respectively (Table 4). There was a statistically significant positive association between the child's measured weight status and the parent's ability to identify the child's weight using verbal descriptors ($p<0.001$) and images ($p<0.001$), respectively. There was no significant difference in the proportion of parents who correctly identified their child's weight status using verbal descriptors as compared to using image descriptors, $\chi^2(1)=0.375$, $p=0.541$.

Peruvian Parents' Sources of Health Information

Table 5 presents the number of participants who were receiving information about physical activity and/or nutrition for their family at the time of the study, including the source and perceived helpfulness of that information. Of the 200 parents who responded to the question about receiving information, 102 parents had children attending one of the participating private schools, and 98 had children attending one of the participating public schools. Of the parents receiving information about nutrition and physical activity, 34 (33.3%) of private school parents were receiving information as compared to 27 (27.6%) of public-school parents. This difference did not reach statistical significance, $\chi^2(1, N=200)=0.788$, $p=0.375$.

Table 4.
Frequency of Parental Ability to Identify Child's Weight by Child's Measured Weight Status

	Parental Assessment of Child's Weight												
	Underestimate				Correct				Overestimate				
	Verbal		Image		Verbal		Image		Verbal		Image		Total
Child Weight	n	%	n	%	n	%	n	%	n	%	n	%	
Healthy	1	1.2	8	9.4	76	90.5	67	78.8	7	8.3	10	11.8	169
Overweight	47	90.4	41	78.8	5	9.6	11	21.2	0	0	0	0	104
Obese	7	100.0	7	100.0	0	0	0	0	0	0	0	0	14
Total	55		56		81		78		7		10		

Table 5.
Sources of Nutrition and Physical Activity
Information Received by Parents

Variable	n (%)
Receiving Information	
Yes	61 (30.5)
No	139 (69.5)
Private School Recipients[*]	34 (33.3)
Public School Recipients[*]	27 (27.6)
Source of Information	
Government Health Center	26 (18.6)
Public Nutritionist	10 (7.1)
Private Nutritionist	2 (1.4)
Pediatrician	6 (4.3)
Radio Program	5 (3.6)
Internet	8 (5.7)
Magazine	4 (2.8)
School	10 (7.1)
Television	8 (5.7)
Other	7 (5.0)
Information is helpful	
Yes	55 (94.8)
Maybe/Unsure	3 (5.2)

[*]Chi-square test of homogeneity indicated there was no significant difference between the percentage of public-school parents and private school parents receiving information, p=0.375

Discussion

Summary of the Findings
Prior to this study, the literature reported that childhood obesity in Peru has been increasing since 1990 and that 13.1% of children under five were overweight or obese (Alvarez-Dongo, Sanchez-Abanto, Gomez-Guizado, & Tarqui-Mamani, 2012; Uauy, Albala, & Kain, 2001). Similarly, this study found that 11.7% of children in the sample were overweight, and an additional 4.8% of the children were obese. In addition to the 16.5% of children in the study sample who were either overweight or obese, another 24.8% of the children had a BMI-for-age measure that classified them as at "possible risk for being overweight" as defined by WHO (de Onis, Blossner, & Borghi, 2010; *Training Course on Child Growth Assessment: WHO Child Growth Standards*, 2008). The number of Peruvian preschool children who fall into this category has not been previously reported in the literature.

This weight classification is pertinent when considering the biological and behavioral changes occurring at the preschool age. Preschoolers are at an age immediately preceding a period of adiposity rebound, in which children experience a rapid increase in BMI (Boonpleng, Park, & Gallo, 2012). Moreover, physical activity is known to decrease as preschool children age into middle childhood (Rowland, 1990). This is particularly startling, considering the large proportion of children in the study sample (87.4%) who are already not receiving the recommended amount of physical activity. These considerations might help to explain the differences reported in the literature in the prevalence of overweight and obese children in the preschool age (13.1%) and older children in Peru (25%) (Carrillo-Larco, Bernabe-Ortiz, & Miranda, 2014). Based on the study findings, reporting only the prevalence of children who are overweight and obese, while omitting a large proportion of children who are borderline overweight, inaccurately depicts the state of the childhood obesity epidemic in Peru.

While Peruvian parents exhibited knowledge of and practiced healthy behaviors, they also exhibited unhealthy attitudes. Henry and colleagues (2014) assessed Mexican American parents' KABs and found similar knowledge and healthy behavior scores among Mexican American parents. However, Mexican American parents exhibited healthier attitudes than our Peruvian parents. Previous studies with Hispanic parents have also found that increasing parental knowledge of nutrition and physical activity improves behaviors (Barkin, Gesell, Po'e, Escarfuller, & Tempesti, 2012; Contento et al., 1993), as such, our finding that unhealthy attitudes were predictive of healthy behaviors was unexpected. It is possible that the high "level of concern" depicted by the BAQ-HH resulted in Peruvian parents changing their behaviors. This finding is unique as compared to other Hispanic populations. Contento (1993) similarly found that high nutrition knowledge among Dominican mothers of preschool children predicted healthy dietary and feeding behaviors,

however, the mothers' unhealthy attitudes about feeding practices did predict unhealthy behaviors.

Prior to intervening with parents, their perceptions of their child's weight must first be understood. These perceptions often vary by culture and ethnicity. Hispanic and other ethnic minorities are more likely to underestimate their child's weight. However, cultural and health behavior differences exist within the Hispanic subgroups (Baughcum et al., 2000; Gauthier & Gance-Cleveland, 2016). The majority (90.4%) of Peruvian parents of overweight or obese children in this study underestimated their child's weight. This is similar to previous findings in Hispanic parents (Baughcum et al., 2000; Gauthier & Gance-Cleveland, 2016). Research has established that Hispanic parents often associate excess weight in preschool children with health, highlighting the need to intervene with these parents and increase their ability to accurately identify their child's weight status and health risks (Baker & Altman, 2015; Lindsay et al., 2011).

Limitations
Several limitations of the study need to be considered. First, the study was cross-sectional in nature, thereby preventing the establishment of any cause and effect relationship between parent perceptions of physical activity and nutrition behaviors and the child's weight status. Secondly, the study utilized convenience sampling rather than random sampling. Additionally, the fact that our study participants were predominantly females, who identified themselves as the primary caretaker and food preparers for their families, limits the generalizability of our findings to fathers of preschool children. Parents were recruited from and completed the surveys at school sites where their children's teachers and the researchers were present, and although the anonymity of all respondents was protected, completing the study at the school site may have influenced the participants to provide socially desirable biased responses to the items on the knowledge,

attitudes, and behaviors scales. One final methodological limitation of the study was the fact that parent surveys and BMI measures were not collected at the same time. BMI measures were extracted from school health records. At the participating school sites, prior to enrolling for the school year, each child must undergo a physical examination. The schools were required to keep this information on file. The parents completed the surveys mid-school year; therefore, it is possible that there were changes in the child's BMI or weight status during the few months that lapsed after the medical exam and prior to the time of the survey.

Implications
The greatest strength of the study is the information it contributes to the currently limited body of knowledge on the emerging childhood obesity epidemic in Peru. This is the only known study to explore Peruvian parents' KABs regarding physical activity and nutrition for their preschool children. Childhood obesity is an emerging issue across Latin America, and the study provides important findings that can inform the design of parent-focused early childhood obesity prevention programs. First, the study establishes important baseline data about both Peruvian parents and children in regards to physical activity and nutrition KABs. Second, the study describes the frequency of healthy and unhealthy behaviors among Peruvian preschoolers, information that can be used to inform the types of interventions that might be effective. Finally, one last strength of the study is that BMI calculations were based on clinically measured weight and height of the child, rather than parent-reported data.

The results of the study have important research and policy implications. Study results provide several focus areas for possible government strategies and future interventions. These strategies should include health communication and education. Education on obesity risks, specifically aimed at helping parents of overweight and obese children to better identify their child's risks are needed.

Additionally, educational campaigns directed at specific health behaviors, such as reducing sugary beverage consumption and increasing physical activity are needed. Current Peruvian government sponsored physical activity and/or nutrition information has been well received by parents, however, only a small portion of the population has received this information. Future efforts should focus on reaching more of the population with this vital health information. Additionally, several study findings warrant further investigation. Nearly one-quarter of the children in the study sample fell into the WHO weight status of 'at risk of being overweight," and the long-term health outcomes and risk of future obesity for these children is unknown. Longitudinal studies that can identify their specific risks of becoming overweight or obese in later childhood or adolescence are warranted to better understand this population. Risk factors that contribute to these children eventually becoming overweight need to be identified. Each of the policy and research suggestions can help to address the emerging early childhood obesity epidemic occurring in Peru.

References

Alvarez-Dongo, D., Sanchez-Abanto, J., Gomez-Guizado, G., & Tarqui-Mamani, C. (2012). Overweight and obesity: prevalence and determining social factors of overweight in the Peruvian population (2009-2010). *Revista Peruana de Medicina Experimental y Salud Pública, 29*(3), 303-313.

Baker, E. H., & Altman, C. E. (2015). Maternal ratings of child health and child obesity, variations by mother's race/ethnicity and nativity. *Maternal and Child Health Journal, 19*(5), 1000-1009. doi:10.1007/s10995-014-1597-6

Barkin, S. L., Gesell, S. B., Po'e, E. K., Escarfuller, J., & Tempesti, T. (2012). Culturally tailored, family-centered, behavioral obesity intervention for Latino-American preschool-aged children. *Pediatrics, 130*(3), 445-456. doi:10.1542/peds.2011-3762

Baughcum, A. E., Chamberlin, L. A., Deeks, C. M., Powers, S. W., & Whitaker, R. C. (2000). Maternal perceptions of overweight preschool children. *Pediatrics, 106*(6), 1380-1386.

Boonpleng, W., Park, C. G., & Gallo, A. M. (2012). Timing of adiposity rebound: a step toward preventing obesity. *Pediatric Nursing Journal, 38*(1), 37-42.

Carrillo-Larco, R. M., Bernabe-Ortiz, A., & Miranda, J. J. (2014). Short sleep duration and childhood obesity: Cross-sectional analysis in Peru and patterns in four developing countries. *PLoS One, 9*(11), e112433. doi:10.1371/journal.pone.0112433

Centers for Disease Control and Prevention. (2018). About child & teen BMI. Retrieved June 1, 2020 from https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html

Contento, I. R., Basch, C., Shea, S., Gutin, B., Zybert, P., Michela, J. L., & Rips, J. (1993). Relationship of mothers' food choice criteria to food intake of preschool children: Identification of family subgroups. *Health Education Quarterly, 20*(2), 243-259.

de Onis, M., Blossner, M., & Borghi, E. (2010). Global prevalence and trends of overweight and obesity among preschool children. *The American Journal of Clinical Nutrition, 92*(5), 1257-1264. doi:10.3945/ajcn.2010.29786

Eckstein, K. C., Mikhail, L. M., Ariza, A. J., Thomson, J. S., Millard, S. C., & Binns, H. J. (2006). Parents' perceptions of their child's weight and health. *Pediatrics, 117*(3), 681-690. doi:10.1542/peds.2005-0910

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175-191. doi:10.3758/BF03193146

Gauthier, K. I., & Gance-Cleveland, B. (2016). Hispanic parents' perceptions of their preschool children's weight status. *Journal for Specialists in Pediatric Nursing, 21*(2), 84-93. doi:10.1111/jspn.12143

Henry, B. W., Smith, T. J., & Ahmad, S. (2014). Psychometric assessment of the Behavior and Attitudes Questionnaire for Healthy Habits: Measuring parents' views on food and physical activity. *Public Health Nutrition, 17*(5), 1004-1012. doi:10.1017/s136898001200554x

Hernandez-Vasquez, A., Bendezu-Quispe, G., Santero, M., & Azanedo, D. (2016). Prevalence of Childhood Obesity by Sex and Regions in Peru, 2015. *Revista Española de Salud Pública, 90*, e1-e10.

Instituto Nacional de Estadistica e Informatica. (2017). *Provincia de Lima compendio estadístico 2017*. Lima, Peru. Retrieved May 1, 2020 from https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1477/libro.pdf

IBM. (2013). SPSS Statistics (Version 22.0). Chicago.

Lindsay, A. C., Sussner, K. M., Greaney, M. L., & Peterson, K. E. (2011). Latina mothers' beliefs and practices related to weight status, feeding, and the development of child overweight. *Public Health Nursing, 28*(2), 107-118. doi:10.1111/j.1525-1446.2010.00906.x

Lora, K. R., Cheney, M., & Branscum, P. (2017). Hispanic mothers' views of the fathers' role in promoting healthy behaviors at home: Focus group findings. *Journal of the Academy of Nutrition and Dietetics, 117*(6), 914-922. doi:10.1016/j.jand.2017.01.005

Loret de Mola, C., Quispe, R., Valle, G. A., & Poterico, J. A. (2014). Nutritional transition in children under five years and women of reproductive age: A 15-year trend analysis in Peru. *PLoS One, 9*(3), e92550. doi:10.1371/journal.pone.0092550

McNemar, Q. (1947). Note on the sampling error of the difference between correlated proportions or percentages. *Psychometrika, 12*(2), 153-157.

Perez Rodrigo, C. (2013). Current mapping of obesity. *Nutrición Hospitalaria, 28 Suppl 5*, 21-31. doi:10.3305/nh.2013.28.sup5.6915

Popkin, B. M., & Gordon-Larsen, P. (2004). The nutrition transition: worldwide obesity dynamics and their determinants. *International Journal of Obesity Related Metabolic Disorders, 28 Suppl 3*, S2-9. doi:10.1038/sj.ijo.0802804

Rao, G. (2008). Childhood obesity: Highlights of AMA Expert Committee recommendations. *American Family Physician, 78*(1), 56-63.

Rowland, T. W. (1990). *Exercise and children's health*. Champaign, IL, England: Human Kinetics Publishers.

Showell, N. N., Cole, K. W., Johnson, K., DeCamp, L. R., Bair-Merritt, M., & Thornton, R. L. J. (2017). Neighborhood and parental influences on diet and physical activity behaviors in young low-income pediatric patients. *Clinical Pediatrics (Philadelphia), 56*(13), 1235-1243. doi:10.1177/0009922816684599

Silveira, J. A., Colugnati, F. A., Poblacion, A. P., & Taddei, J. A. (2015). The role of exclusive breastfeeding and sugar-sweetened beverage consumption on preschool children's weight gain. *Pediatric Obesity, 10*(2), 91-97. doi:10.1111/ijpo.236

The Lancet Diabetes. (2014). Obesity prevention in Latin America: Now is the time. *Lancet Diabetes Endocrinology, 2*(4), 263. doi:10.1016/s2213-8587(14)70079-8

Torres-Roman, J. S., Urrunaga-Pastor, D., Avilez, J., Helguero-Santin, L., & Malaga, G. (2018). Geographic differences in overweight and obesity prevalence in Peruvian children, 2010-2015. *BMC Public Health, 18*(1). doi:10.1186/s12889-018-5259-2

Trost, S. G., Sirard, J. R., Dowda, M., Pfeiffer, K. A., & Pate, R. R. (2003). Physical activity in overweight and nonoverweight preschool children. *International Journal of Obesity Related Metabolic Disorders, 27*(7), 834-839. doi:10.1038/sj.ijo.0802311

Uauy, R., Albala, C., & Kain, J. (2001). Obesity trends in Latin America: Transiting from under- to overweight. *The Journal of Nutrition, 131*(3), 893s-899s.

World Health Organization, Department of Nutrition for Health and Development (2008). *Training course on child growth assessment: WHO child growth standards Module C Interrepting Growth Indicators*. Geneva, Switzerland. Retrieved June 2, 2020 from: https://www.who.int/childgrowth/training/module_c_interpreting_indicators.pdf?ua=1

Weygandt, P. L., Vidal-Cardenas, E., Gilman, R. H., Avila-Tang, E., Cabrera, L., & Checkley, W. (2012). Epidemiology of tobacco use and dependence in adults in a poor peri-urban community in Lima, Peru. *BMC Pulmonary Medicine, 12*, 9. doi:10.1186/1471-2466-12-9

Acknowledgements

Corresponding Author Information
 Kathleen McInvale Trejo (ORCID: 0000-0002-3226-5711)
Assistant Professor, Department of Health and Human Performance
College of Charleston
24 George Street
Room 222
Charleston, South Carolina 29424
Email: mcinvaleke@cofc.edu