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Influence of BMI, Gender, and Hispanic Ethnicity on Physical Activity in Urban Children

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Abstract

Purpose—This community-based participatory research study examined the association between overweight status and activity among Hispanic urban, school-age children.

Design and Methods—In a sample of 140 children, activities were assessed using the Youth Risk Behavior Survey's questions about physical activity and team sports.

Results—Thirty-nine percent were overweight (Body Mass Index (BMI) > 85%). Normal-weight children had higher levels of physical activity and team sports. Females had lower levels of physical activity and team sports. Significant associations included BMI and sports team participation, and BMI and Hispanic ethnicity.

Practice Implications—Nurses should be aware that Hispanic urban children are at risk for lower activity.

Search terms

Childhood obesity; community-based participatory research; Hispanic; physical activity; school health

Childhood obesity is a growing health concern both globally and within the United States. In the last 30 years, obesity rates, defined as greater than the 95th percentile for Body Mass Index (BMI) for age-gender, have more than doubled in children 2–5 years old and in adolescents 12–19 years old. Rates among children 6–11 years old have tripled (Lutfiyya, Garcia, Dankwa, Young, & Lipsky, 2008; Wang & Lobstein, 2006). Although the rate of overweight and obesity is increasing for all children in the United States, there is some evidence that suggests that racial and ethnic minorities and those from a lower socioeconomic status (SES) are at greater risk for being overweight or obese (Ball et al., 2008; Oude et al., 2009). According to the Institute of Medicine, up to 24% of African American and Hispanic children are obese (Dehghan, Akhtar-Danesh, & Merchant, 2005). Among school-age children in 2003–2004, 42.9% of Mexican American children 6–11 years old and 40% of African American children 6–11 years old were overweight (85th–94th percentile for BMI for age-gender; Gentile et al., 2009). Furthermore, the highest prevalence of childhood obesity among boys has been observed in Hispanics, whereas the highest prevalence among girls was found in African Americans (Wang & Lobstein, 2006). In Los Angeles, California, 18% of Hispanic children are overweight, and 22.9% of 7th grade Hispanics do not meet the overall goals set by the state for physical fitness. In addition, 24.6% of Hispanics live below the federal poverty level (L.A. Children's Planning Council, 2008). Suggested factors for the cause of childhood obesity include improper nutrition

practices, decreased child activity levels, underlying genetic and metabolic factors, socioeconomic disadvantages, altered child temperament, and family neglect (Lutfiyya et al., 2008). Adopting and maintaining healthy lifestyle behaviors can help overweight boys and girls manage their weight and reduce obesity-related health risks.

The American Dietetic Association (ADA) recently completed a comprehensive evidence analysis of behavioral factors that are associated with childhood overweight. Adequate evidence (Grade II) showed that a major factor placing children at risk for overweight is reduced physical activity (PA; Dencker, Thorsson, Karlsson, Lindén, Svensson, et al., 2006; Dencker, Thorsson, Karlsson, Lindén, Eiberg, et al., 2006; Gilbride, 2006). Studies have reported that the greatest decrease in PA occurs during early to late adolescence (i.e., 3rd–10th grade), primarily among girls and minorities (Bradley, McMurray, Harrell, & Deng, 2000). Children are more active than adults, but their activity levels decline as they move toward adolescence, and significant numbers of young people do not participate in recommended levels of PA. The 2009 Youth Risk Behavior Surveillance Study (YRBS; Eaton et al., 2010) provides documentation of the inadequate levels of PA among high-school-age youth (grades 9–12); 23.1% of all high-school students surveyed did not participate in at least 60 minutes of physical activity on any day. Of these, the prevalence was higher in students in the 12th grade (25.6%) and 11th grade (22.9%) as compared with those in the 9th grade (21.8%), and among African American (32.1%) and Hispanic (23.9%) students as compared to White students (20.3%). In addition, the prevalence of using computers 3 or more hours per day on other than school-related business was higher among 9th-grade (28.7%) than 10th-grade (25.5%), 11th-grade (23.4%), and 12th-grade (21.2%) students, and higher among African American (30.4%) and Hispanic (25.7%) than White (22.1%) students (Eaton et al., 2010).

As a result, efforts need to be focused on increasing PA opportunities among early adolescents to develop healthy living behaviors and decrease excessive weight gain. The school setting has a primary role in the promotion of PA among normal-weight children and overweight children (Thomas, 2006). In particular, physical education class (PE) and participating in intramural sports teams have received increased attention relative to their importance and potential in providing both normal-weight students and overweight students with appropriate amounts of time in PA (Taras et al., 2004).

With the growing problem of obesity in children and adolescents, much attention has focused on BMI measurement programs in schools, especially those programs conducted by trained personnel, such as a nurse (Nihiser et al., 2007). BMI percentiles are the most commonly used indicator to assess the size and growth patterns of individual children in the United States. Some states, such as Arkansas, have initiated BMI measurement programs in recent years. In California, students participate in physical fitness testing that assesses BMI along with other fitness-related variables (Nihiser et al., 2007).

There are few published reports that examine PA levels of early adolescents' participation in PE class and intramural team sports, especially among urban, Hispanic adolescents (Babey, Hastert, Yu, & Brown, 2008; Duke, Human, & Heitzler, 2003). While some studies have identified health disparities within pediatric obesity, few studies have examined the PA health behaviors of specific racial and ethnic groups, especially Hispanics, living in urban and low-income settings, and related this to weight status (e.g., body mass index) and gender, nor have these studies sufficiently discussed the implications for nursing practice for assessment and prevention of pediatric obesity. The purpose of the current study was to examine the associations between gender and Hispanic ethnicity, the behavioral factors of PA, the attendance of school PE classes, participation in sports teams, and weight status among urban, Hispanic early adolescents ages 7–11 years (1st–5th grade) at a Los Angeles,

California, elementary school. This community-based participatory research (CBPR) study was conducted through a collaboration of nurses, public health practitioners, and school administrators in an effort to understand PA behaviors among this underserved community to provide information on ways that nurses and other healthcare providers could promote physical activity as a means to prevent childhood obesity in Hispanic child populations and, with the support of the community, to assist the researchers in developing future culturally appropriate interventions.

Theoretical Framework

The social ecologic model is focused on patterned behavior that is determined by *intrapersonal factors*, individual characteristics such as knowledge, skills, and behaviors; *interpersonal processes*, formal and informal social networks and social support systems such as one's family; and *community/institutional factors*, relationships among organizations and institutions within defined boundaries, such as the school and home environment (McLaren & Hawe, 2005). According to McLaren and Hawe (2005), health promotion interventions are based on our beliefs and understandings of the determinants of behavior, and these three levels of analysis reflect the range of potential strategies available for health promotion programs. Understanding the physical exercise behaviors of underserved Hispanic children is imperative in developing culturally and linguistically appropriate nursing interventions that will be successful in preventing children in this population from becoming overweight. The social ecologic model was used in this study to identify such PA behaviors among a population of underserved, urban Hispanic elementary school children. Intrapersonal factors included age, gender, grade and weight status (a measurement of health status and defined as normal weight vs. overweight [see Youth Risk Behavior Survey Tool and Anthropometric Measures Section, for further explanation of definition]). Interpersonal factors focused on culture, including ethnicity and primary language spoken at home (e.g., English or Spanish), and PA levels (days child was physically active for at least 60 minutes). Community/institutional factors included attendance in school PE classes and participation in team sports, either at the school site or in the community.

Review of the Literature

Epidemiologic research demonstrates that obesity is becoming more prevalent in adolescents, specifically low-income and urban populations and racial/ethnic minorities, such as Hispanics. Insufficient PA contributes to the rise of adolescent obesity and the risk of complications from chronic conditions such as CVD and type-2 diabetes. Consequently, the literature concludes that although preventive efforts in childhood obesity are important for the entire U.S population, such efforts may be particularly critical for Hispanics, a relatively neglected and greatly expanding sector of the population.

Burden of Overweight and Obesity on Children: The Importance of Studying Hispanic Populations

There is an increase in the United States in the prevalence of children who are overweight (have a BMI between the 85th–94th percentile for age-gender) or obese (have a BMI $\geq$ the 95th percentile for age-gender). An estimated 31.7% of children and adolescents ages 2–19 years in the United States are overweight, and 11.9% either meet or exceed the 97th percentile for BMI by age-gender (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Results from the 2007–2008 National Health and Nutrition Examination Survey (NHANES), using measured heights and weights, indicate that an estimated 15% of children and adolescents ages 2–19 years are overweight and 17% are obese. While there was an increase in obesity prevalence between 1976–1980 and 1999–2000, there was no significant increase in obesity prevalence between 1999–2000 and 2007–2008 (Ogden et al., 2010). Data from the 2007–

2008 NHANES study also indicate that among U.S. children and adolescents ages 2–19 years obesity prevalence is higher in females (17.9%) than males (16.9%). In addition, the NHANES data show there are stark racial/ethnic disparities in the prevalence of childhood obesity: The obesity epidemic has been especially notable in Hispanics (20.9%), particularly Mexican Americans (20.8%) and Puerto Ricans, as compared to African Americans (20%) and Whites (15.3%; Mendoza, 1994; Ogden et al., 2010). The high rates of obesity among Hispanic populations is concerning as Hispanics are the fastest growing ethnic group in the United States. In terms of SES, one study using the Centers for Disease Control and Prevention (CDC) Pediatric Nutrition Surveillance System (PedNSS) found that one of seven low-income, preschool-age children in the United States is obese. That study also reported that the prevalence of obesity in low-income children ages 2–4 years increased from 12.4% in 1998 to 14.6% in 2008 (Sharma et al., 2009).

In Los Angeles County, the rate of children with a BMI in the 85th–95th percentile is even higher. A state-wide physical fitness testing program of 5th-, 7th-, and 9th-grade students attending public schools in 2001 found that 22.9% of students in Los Angeles County had a BMI in the 85th–95th percentile and an additional 19% were at risk for developing this same BMI (Lee, De, & Simon, 2006). Overweight children are more likely to become obese adults than are normal-weight children (Serdula, Ivery, Coates, Freedman, Williamson, & Byers, 1993; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). For example, one study found that 25% of obese adults were overweight as children and also found that if overweight begins before 8 years of age, obesity in adulthood is likely to be more severe (Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001). Another study found that approximately 80% of children who were overweight at ages 10–15 years were obese adults at age 25 years (Serdula et al., 1993). Among Hispanics, the higher prevalence of obesity among Mexican American and Puerto Rican children appears to start as early as 6–7 years of age and is seen throughout adolescence and adulthood (Mendoza, 1994). Overweight children may experience psychological stress, poor body image, low self-esteem, feelings of shame, and embarrassment (Must & Strauss, 1999; Mustillo et al., 2003; Puhl & Latner, 2007).

In addition to psychological problems, obesity has several negative physical consequences; for example, obesity in teenagers is associated with an increased risk of hypertension and hypercholesterolemia (Carr, Brunzell, & Deeb, 2004; Sprafka, Norstead, Folsom, Burke, & Luepker, 1992). These increased rates of obesity are related presumably to increased caloric intake versus less expenditure of energy in PA (Muecke, Simmons-Morton, Huang, & Parcel, 1992). Other obesity-related diseases such as CVD and diabetes disproportionately affect racial/ethnic minorities, especially Hispanic populations. Cardiovascular mortality among Hispanics appears to be lower than among Whites, but cardiovascular disease is the leading cause of death among Hispanics (Hunt et al., 2003; Swenson, Trepka, Rewers, Scarbro, Hiatt, & Hamman, 2002). Compared with non-Hispanic Whites, Mexican Americans are characterized by increased overall adiposity (Okosun et al., 2003) and unfavorable body fat distribution (Stern & Mitchell, 1995), and along with Puerto Rican Americans, they have substantially higher prevalence of diabetes (National Diabetes Information Clearinghouse, 2008). Due to the high rates of obesity and obesity-related disease among Hispanic populations, the National Institutes of Health in its landmark report, *Working Group Report on Future Research Directions in Childhood Obesity Prevention and Treatment* (National Institutes of Health, 2007), recommended an increase in CBPR research, like this current study, to inform population-based approaches for the prevention of childhood obesity in high-risk populations, including Hispanics.

Benefits of PA for Children

Daily PE and activity allows students to acquire the skills and attitudes necessary for lifelong participation in PA, known to treat and/or prevent obesity. In addition, studies have

shown that physical fitness and activity are associated with metabolic syndrome, type-2 diabetes mellitus, and cardiovascular disease, and increased academic achievement (Powell, Thompson, Caspersen, & Kendrick, 1987; Sallis, McKenzie, Kolody, Lewis, Marshall, & Rosengard, 1999; Steinberger & Daniels, 2003). Efforts to promote increased physical activity and the adoption of healthy eating habits would presumably increase fitness and minimize weight gain in young Hispanic adolescents.

Guideline for Child PA

The American Academy of Pediatrics (AAP) and the National Association of School Nurses recommend that all students from kindergarten through Grade 12 be provided with daily PA (Taras et al., 2004). The U.S. Department of Health and Human Services (2008) further recommends children should have 60 minutes or more of PA every day and that this exercise should be divided into aerobic, muscle strengthening, and bone strengthening activities. There is no federal law that requires PE to be offered. In fact, states and school districts usually provide the specific direction for PE and mandate time allocations, content, and minimum standards (National Association for Sport and Physical Education [NASPE], 2002; U.S. Department of Health and Human Services, 1996). As of 2006, in the United States 69.3% of elementary schools, 83.9% of middle schools, and 95.2% of high schools required PE. In California, the California Department of Education mandates that a certain number of minutes of PE be required; for example, in elementary grades 1–6, the requirement is a minimum of 200 minutes each 10 days, and for secondary grades 7–12, there is a minimum of 400 minutes each 10 days (California State Board of Education, 1999). However, this mandate has been difficult to enforce, and, in 2000, among grades 6–8, PE class times totaled 156 hours for that year (Burgeson, Wechsler, Brener, Young, & Spain, 2001).

Disparities in Early Adolescent PA

Despite the potential for PA to help reduce or maintain weight, PE classes provide only minimal activity, and they are becoming less common in schools (CDC, 2007). According to the School Health Policies and Programs Study (SHPPS) on the nation's PE standards and guidelines, only 6.4% of middle schools provided daily PE for the entire school year (CDC, 2007). Unfortunately, adolescents are less active than recommended and do not meet national goals for health-related physical activity (U.S. Department of Health and Human Services, 1996). Results from the 2009 Youth Risk Behavior Survey indicate that the prevalence of inactivity increases during adolescence (Eaton et al., 2010). Research has shown that the transition from childhood to adolescence is associated with a 34% decline in PA in girls (Kimm et al., 2000), and twice as many high school girls as boys report no vigorous PA during the past 7 days (13.8% vs. 7.3%; U.S. Department of Health and Human Services, 2008).

Within schools, PE classes provide a critical opportunity for youth to engage in PA, become physically fit, and learn movement skills. Daily PE is frequently recommended for all students (NASPE, 2002; U.S. Department of Health and Human Services, 2008). Currently, students have limited opportunities for PA in PE, and only 32% of females and 45% of males report being physically active for 20 min or more in their classes (McKenzie, Marshall, Sallis, & Conway, 2000; U.S. Department of Health and Human Services, 2008). Moreover, students engage in moderate to vigorous physical activity (MVPA) much less than the recommended 50% of PE class time (McKenzie et al., 2000; U.S. Department of Health and Human Services, 2008).

Racial/ethnic and gender disparities also exist among child PA levels, especially for Hispanic early adolescents living in urban communities. A national study of 9- to 13-year-

olds revealed that as compared to their White counterparts, Hispanic early adolescents were less likely to participate in organized (e.g., team) sports (25.9% vs. 46.6%) and less likely to participate in free time PA (74.6% vs. 79.3%); while both males (38.6%) and females (38.3%) participated in organized sports at similar levels, males (80.5%) participated in more free-time PA than females (74.1%; Duke et al., 2003). Another study of Hispanic elementary school students in urban Los Angeles revealed that overweight Hispanic boys engaged in less PA than non-overweight Hispanic boys (Byrd-Williams, Kelly, Davis, Spruijt-Metz, & Goran, 2007). Understanding the racial/ethnic and gender disparities in child physical activity is imperative in assisting nurses and other healthcare providers in providing Hispanic children and families information on ways they can promote PA as a means to prevent childhood obesity, which was the focus of this study.

Methods

Design

This was an exploratory study to assess the PA behaviors of low-income Hispanic children in a public school in urban Los Angeles, California. Children were between the ages of 7 and 11 years, were Hispanic, attended an elementary school in urban Los Angeles, and the majority of the children were eligible for the free lunch program (indicating low-income). In order to be compliant with the California Department of Education's (CDE) PE requirement and to follow the AAP recommended PA guidelines, the school required students to participate in daily PE classes if school was in session. Consistent with a CBPR framework, a Community Advisory Board (CAB) composed of 14 active community stakeholders (including academicians, school administrators, teachers and parents and parent association members) was formed and met quarterly to advise the researchers on study design, recruitment, retention, and dissemination of information.

Subjects

The children who participated had their parents' permission to be a part of the study, and they agreed to be in it as well. Children were recruited via (a) a mailed flyer in the school orientation packet that was sent to all parents, (b) verbal announcements and flyers given by school staff and members of a CAB at the After School Program and various parent association meetings, and (c) flyers posted in strategic places at the school. All flyers and verbal announcements were in English and Spanish. The specific inclusion criteria included: (a) age 7–11 years, (b) attending the elementary school being studied, and (c) having the ability to speak English or Spanish. A power analysis showed that for a large effect size of 0.5, an alpha of 0.5, and power of 0.80, 130 students were needed in the study. One hundred and ninety children were eligible for the study, and, of those, 140 participated. Prior to the start of research, the study procedures were reviewed and approved by the University Office for Protection of Research Subjects, Institutional Review Board (IRB).

Youth Risk Behavior Survey Tool and Anthropometric Measures

Based on recommendations from the CAB, there were two means of data collection, the 2007 Youth Risk Behavior Survey (YRBS) measures and anthropometric measures. The YRBS is implemented by the CDC to assess various types of youth behaviors including diet patterns, lifestyle habits, PA, and others that determine the risk factors affecting the youth population. The YRBS has been shown to be a valid and reliable test for multi-ethnic groups of middle-school-age children (i.e., 6th–8th grade; CDC, 2008). It has been approved by the CDC for use with elementary school children if administered in a developmentally appropriate way, such as reading the questions and/or using a visual aid (Kinchen, 2007). The YRBS was available in English but was also translated into Spanish, using the translation-back-translation method (CDC, 2008). A modified version of the 2007 YRBS

was used that included demographic data (age, gender, race/ethnicity, and grade) questions on daily PA, school PE class attendance, and participation in sports teams. See Table 1 for questions and definitions of variables and constructs from the YRBS.

The children's weight status was determined via the clinical measurements of height, weight, and BMI for age and gender (Kuczmarski et al., 2002). For the purposes of this study, students were classified as normal-weight (BMI percentage of 5% to < 85%) or overweight (BMI percentage $\geq$ 85%) based on the clinical measurements of height and weight used to calculate BMI, and on their age and gender (Kuczmarski et al., 2002).

Procedures

Recruitment and the consent/assent process occurred from March to May 2008. From May 2008 to December 2008, students underwent anthropometric measures and completed the YRBS. To ensure privacy and confidentiality of all results and to reduce any embarrassment associated with weight status, all anthropometric measures were conducted by two trained research associates in a private room designated by the school. To decrease inter-observer measurement errors, the following procedures were followed: utilizing the Healthometer 500KL Digital Scale with Height Rod, weight was measured twice (once by each of the research associates) to the nearest 0.1 kg with shoes removed using a digital scale located in the assessment area. If the two measurements of weight varied by more than 0.2 kg, a third measurement was taken by the PI. Height was measured twice to the nearest 0.1 cm using the stadiometer attached to the digital scale with a standing stadiometer. If the two measurements of weight varied by more than 0.2 cm, a third measurement was taken by the PI. From the weight and height measurements, the BMI was calculated ($\text{BMI} = \text{weight}[\text{kg}] / \text{height}[\text{m}^2]$) via the digital scale and confirmed for accuracy using the BMI wheel and charted on the appropriate CDC Growth Chart. In addition to the author, two trained research team members also administered, proctored, and collected the YRBS. Training included pre-testing of the YRBS among 10 child volunteers from the school site who gave feedback regarding terminology and format of the YRBS and the testing procedures and environment.

To enhance confidentiality and to foster a safe environment for the students to honestly answer the questions, students were directed to sit at an individual desk, look only at their own papers when answering questions, and not talk during the administration of the survey, except to ask questions of the research team. The survey questions were read aloud and simultaneously shown on a large screen until all of the survey questions were completed. Students were given the choice to complete the test in English or Spanish.

Data Analysis

Data analyses were conducted using SPSS Statistical Software, Version 16.0 (Norosis, 2008). Descriptive statistics were used to describe the prevalence of normal weight, overweight, and the frequency of those participating in daily PA and sports teams and attending school PE. Bivariate analysis (correlations and Pearson chi-square tests) were used to test associations between weight status (BMI) and activity behaviors. Multiple regression analysis was used to assess independent predictors of childhood overweight. Ninety-five percent confidence intervals (CIs) were estimated for all regression analyses and the level of significance for all analyses was defined as p equal to or less than 0.05.

Results

Among the 140 urban, Hispanic children who participated in this study, there were 82 girls (58.6%) and 57 boys (40.7%; Table 2). There was one subject with missing data for

demographics questions. All of the children were Hispanic. More children (52.1%) spoke Spanish than English (47.9%). Most children were 7 years old (40%), followed by 9 years old (28%). Based on BMI category, 57.1% of the children were considered normal-weight and 36.4% were overweight.

Physical Activity

Overall, low PA was reported by 55 (39.3%) children while high PA was reported by 84 (60%) children. Of those who reported high PA, 43 (33.1%) were normal weight and 35 (26.9%) were overweight. These differences were not statistically significant (Table 3). More females (36.0%) reported high PA than did males (24.5%). While younger students (grades 1-2) reported low levels of PA (27.3%), older students (grades 3-5) reported higher levels of PA (38.1%), at a significant level ($p = .001$). English-speaking children participated in PA more than Spanish-speaking children did.

PE Class Attendance

Half (54.6%) of the students reported a high PE class attendance. One third of the normal-weight adolescents had high PE class attendance, but differences across the groups were not significant (Table 3). Males reported higher PE class attendance (27%) than did females; this difference was statistically significant. High-level attendance was reported more frequently by younger students (56.8%) as compared to older students (43.2%). In contrast to PA, more Spanish-speaking children reported high levels of PE class attendance (31.7%) than did English-speaking children (21.6%).

Participation in Sports Teams

Overall, 53 children (40.8%) reported that they had not participated in any intramural team sports. As compared to overweight children, the majority of normal-weight students reported not participating in any team sports (27.7%), but there were some who reported participating on 1 team (14.6%), three or more teams (13.8%), and two or more teams (4.6%); these differences were significant (Table 3). While more overweight children reported participating in no team sports (13.1%), 10% reported participating in three or more sport teams and 9.2% reported participating on two sports teams; these were significant. More female children (28.8%) reported not participating on any teams than did male children (11.5%). An equal percentage (10.8%) of male and female students reported participation on one team. Spanish-speaking students (24.5%) had less participation on teams than did English-speaking students (15.8%), but the difference was not significant. A significant association was seen between BMI and sports team participation ($p = .029$). Students who participated on a sports team had lower BMI.

Significant Predictors of Overweight

Multiple regression analysis was used to analyze the predicting factors for being overweight. Predictors included sports team participation and Hispanic ethnicity, as significant associations were seen between BMI and sports team participation ($p = .043$); those with low sports participation had 1.446 greater odds (95% CI, .480 to 4.359) of being overweight; and between BMI and Hispanic ethnicity ($p = .036$), Hispanics had 5.900 greater odds (95% CI, 2.54 to 9.32) of being overweight. There were no significant associations between BMI and any other demographics or other activity parameters (PA, PE class attendance).

Discussion

While some studies have identified health disparities within pediatric obesity, few studies have examined the specific PA health behaviors of specific racial and ethnic groups living in

urban and low-income settings, and related this to weight status among early adolescent populations. Due to the increase in prevalence of childhood obesity among Hispanic early adolescent populations, this study utilized the social ecologic model, a behavior theory, to understand PA behaviors of Hispanic elementary school children so that this data could guide nurses and other healthcare practitioners in creating future cultural and linguistically appropriate obesity prevention interventions for urban Hispanic children and their families. In terms of general intrapersonal factors, this study found 36.4% of the children to be overweight (BMI $\geq$ 85th percentile for age-gender). This is greater than the U.S. average of 22.9% (Lee et al., 2006). These results are higher than other studies among urban, low-income Hispanic populations that found a lower overall prevalence (e.g. $<$ 20%) of overweight and obese children (Silveira et al., 2006). Further studies among Hispanic early adolescents are needed to fully understand why there is a high prevalence of overweight and obesity in this population.

As is common within the socio-ecological framework, several of the factors interrelate, and it is the interrelation of these factors that brings deeper insight into the understanding of obesity-related activities (e.g., PA; Fitzgerald & Spaccarotella, 2009). In terms of the intrapersonal factor of age, the interpersonal factor of PA, and the community/institutional factor of participation in team sports, this study showed that younger Hispanic children participated in less physical activity including team sports activities. This finding is similar to the national studies that found that fewer children ages 9 to 13 years reported involvement in organized sports (Duke et al., 2003). In terms of weight status, another intrapersonal factor, normal-weight children (BMI 5%-84%) had higher levels of PA, PE class attendance, and participated in three or more team sports, as compared to overweight (BMI $>$ 85%) children. These findings are similar to previous studies among Hispanic elementary-school children that found that overweight students engage in less PA than non-overweight students (Byrd-Williams et al., 2007).

In terms of gender, an intrapersonal factor, an important finding in this study is that more females had high levels of PA participation (interpersonal factor) even though they attended fewer PE classes (community/institutional factor). This is different from a study that found a higher participation in PA among males (43.7%) than females (25.6%; Butte, Puyau, & Adolph, 2007). However, similar to another study, there were high levels of PE class attendance by students in the current research study, with the majority being male (Butte et al., 2007). Increase in PA and PE class attendance may be due to the state board of education and local school district creating regulations about PA and attending PE classes that follow the recommendations by the AAP. For example, in 2009 the California State Department of Education adopted the *Physical Education Framework for California Public Schools: Kindergarten through Grade Twelve* document that requires physical education instruction, based partially on the AAP and CDC recommendations (California State Board of Education, 2009); consequently this school has a daily PE requirement.

In relation to the joint intrapersonal and community/institutional factors of gender and team sports participation, the findings of gender differences in team sports participation is not surprising and is similar to previously reported data on team sports. Previous studies have also found gender differences in sports team activities, with males demonstrating a strong preference for participating in team sports (Hill & Cleven, 2005; Kulinna, Martin, Lai, Kilber, & Reed, 2003). One study found that girls in the 4th through 6th grades preferred to participate in activities that were not extremely vigorous or competitive and concluded that if team sports included activities such as aerobics, contemporary dance, or tennis, activities that female adolescents prefer, perhaps their rates of participation would increase (Hill & Cleven, 2005).

Ethnicity (an interpersonal-level representation of culture in this study) was found to be related to weight status (an intrapersonal factor). This is similar to other studies that found that Hispanic children had higher rates of overweight as compared to White children (Springer et al., 2009). Among Spanish-speaking children, disparities regarding activity were reported. While more Spanish-speaking students reported high levels of PE class attendance (community/institutional factor), more Spanish-speaking children reported low PA (interpersonal factor) and low levels of team sports participation (community/institutional factor). These results are similar to previous research that showed Spanish-speaking children were less likely to participate in PA as compared to English-speaking children (Springer et al., 2009). Another study looked further within Hispanic groupings and found that first-generation, non-English speakers were half as likely to engage in regular PA and sports (Taverno, Rollins, & Francis, 2010). Findings from this current study indicate important disparities in Hispanic children's PA participation and the need for further research to examine obesity-related programs.

According to general studies on PA and children, several of these aforementioned behavioral findings including low levels of PA, participation in team sports, and attending PE classes, may be due to socio-ecologic-related barriers to PA and can lead to poor health outcomes among children and youth. For example, intrapersonal level (e.g., age, gender, weight status) barriers may include lack of knowledge about the health benefits of being physically active and lack of self-confidence and motivation to participate in physical activities (Rees et al., 2006). Interpersonal barriers to PA may include lack of social support (e.g., from same-sex peers or families) in their physical activities. In addition, culture, or specifically acculturation, the process by which racial/ethnic groups adopt the cultural patterns of the dominant group (Satia-Abouta, Patterson, Neuhouser, & Elder, 2002), can be a barrier at the interpersonal and the community/intuitional levels because culture and cultural preference can be seen as a part of the social environment within the family and in the community or school setting and can have a strong influence on the physical activities of a child. For example, similar to other studies (Springer et al., 2009), in the current study, children who were less acculturated (e.g., Spanish speakers) were less likely to participate in PA and team sports.

Socioeconomic characteristics of schools can be community/institutional barriers to PA among underserved children. A national study that surveyed Hispanic parents of early adolescents concluded that key barriers to Hispanic children's participation in PA included expenses related to PA programs (62.3%), issues with transportation to the PA programs (36.9%), and lack of PA opportunities in their communities (30.8%; Duke et al., 2003). For example, due to financial burdens, underserved neighborhoods may offer fewer team sports programs and/or may have less access to adequate, safe space for children to play. In addition to an underserved community, urban schools may have less PA equipment (e.g., balls, jump ropes) to be used in physical activities. Consequently children do not engage in developmentally appropriate PA during recess or PE class (Girandola & Chin, 2004), which may lead to increases in the prevalence of overweight and obese children. In order to decrease disparities in PA among urban Hispanic children, there must be an alleviation of these financial barriers associated with participation in PA in the community. More studies focusing on racial/ethnic minority groups, including qualitative or mixed qualitative and quantitative studies, need to be done to further understand the specific socio-ecologic-related PA barriers and solutions to the barriers of Hispanic elementary-school children. Additional recommendations to overcome these barriers are discussed in the Implications section of this paper.

Limitations

Several study limitations must be acknowledged. The use of a standardized survey with prescribed questions limited the ability of the researchers to modify the questions or add to the questions and limited the opportunity to ask qualitative questions, which may have allowed the researchers to obtain a more in-depth understanding of some of the behavioral findings. The 2007 YRBS tool was originally intended for 6th- through 8th-grade students, and, although the implementation was approved by the CDC for use in this current age group and modified to adjust for the developmental stage of the participants, more studies should be done in this age group to determine reliability of the tool. The survey was conducted only on a sample set of children who attended this school and hence the results obtained in this setting cannot be applied to all the children of this age group in general. Generalizability of the results to groups of children of different ages and to other ethnic backgrounds may be limited; therefore, similar studies need to be conducted with a more culturally diverse sample.

Implications

The findings of this study alert nurses both at the patient/clinical level and at the school/community level about the concerning lack of PA among the Hispanic children in this sample. Whereas this study did not test interventions, conscious-raising about lack of PA carries implications for practice. In the patient/clinical setting nurses can assist providers by obtaining a focused family history for obesity, for type-2 diabetes mellitus, and for cardiovascular disease (particularly hypertension). The AAP (2003) recommends that in the clinical setting, nurses and other healthcare providers include the following health supervision activities: (a) identify and track patients at risk by virtue of family history, birth weight, or socioeconomic, ethnic, cultural, or environmental factors; (b) calculate and plot BMI once a year in all children and adolescents; and (c) use change in BMI to identify rate of excessive weight gain relative to linear growth. In addition, nurses can assist in providing an assessment of levels of PA and sedentary behaviors for all pediatric patients at each well-child visit for anticipatory guidance. This assessment should include the general areas of (a) self-efficacy and readiness to change, (b) environment and social support, and barriers to PA, (c) whether the child is meeting the daily PA recommendations, and (d) levels of sedentary behavior. Nurses can help to overcome intrapersonal barriers to PA by providing education and/or clinical counseling to increase awareness, skills, and knowledge about the benefits of PA. Nurses can also counsel children and families to avoid sedentary behaviors and to engage in recommended PA behaviors by providing them with culturally and linguistically appropriate resources such as those from the AAP and National Heart Lung Blood Institute (Barlow, 2007; Table 4).

For Hispanic children, this study shows that it may be efficacious to aim education/counseling to increase PA toward older children (grades 3–5) and males (e.g., not only to attend PE classes but to also participate while there) and to recommend participation in team and family sports as a means to increase overall PA. Social support and group participation may help overcome intrapersonal barriers (Wilcox, Castro, King, Housemann, & Brownson, 2000). Nurses should use culturally and linguistically appropriate resources, decreasing potential interpersonal cultural barriers and health disparities in PA among Spanish-speaking only families (Wilcox et al., 2000). This may mean, for example, to promote 60 minutes a day of moderate to vigorous PA by promoting playing culturally favorite games, like soccer, Las Cuatro Esquinas (Four corners), La Araña (The spider), or Tiente Envenenada (Poisoned tag; Table 5).

At the school/community level, because children spend a large amount of time in school, nurses are in a unique position to address the critical public health concern of childhood

obesity, especially for low-income and minority populations who may not have access to safe places to participate in physical activities (Kumanyika & Grier, 2006). According to the American Nurses Association (Berkowitz & Borchard, 2009), nurses can work in tandem with schools and school systems to overcome community/institutional barriers and ensure childhood obesity prevention by

- Advocating for the federal government to increase PA at schools through intervention programs,
- Advocating for federal, state, and local funding for PA programs at schools and in the
- community, and
- Supporting efforts to preserve and enhance parks as areas for PA and to develop walking and bicycle paths.

Community Advisory Board members can use this information to help reduce disparities in child obesity among Hispanic populations by advocating for a school-based curriculum that includes child and parental education regarding the benefits of and need for PA for school-age children and follows the recommendations of the State Department of Education and the AAP. Those recommendations include 60 minutes per day of PA that is developmentally appropriate, enjoyable, and involves a variety of activities (AAP, 2000).

How Do I Apply This Evidence to Nursing Practice?

The majority of children in this study did not participate in the recommended 60 minutes of daily PA or in team sports. To decrease racial/ethnic and gender disparities in childhood obesity in Hispanic populations, increased rates of participation in both PE classes and organized team physical activities are needed. To avoid the morbidity associated with obesity in adulthood, aggressive physical exercise programs, which are culturally appropriate, are needed for school-age Hispanic children. The findings also suggest that there is a need for nurses and other health and public health practitioners to educate Hispanic children and parents in the recommended daily PA guidelines and provide suggestions for ways to increase daily activity, including attending and actively participating in school PE and team sports. While the results of this study add to our understanding about the influence of gender, BMI, and Hispanic ethnicity on PA among school-age children, there is a need for further investigation into the role that ethnicity and BMI status plays in PA levels, particularly among ethnic and gender sub-groups.

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Table 1

Questions and Responses from the 2007 Youth Risk Behavior Survey

Question	Response
1. How old are you?	Age choices range from 7–12 years
2. What is your gender	Dichotomous, male (boy)/female (girl)
3. In what grade are you?	Grade choices range from 1 st –5 th grade
4. Ethnicity- Are you Hispanic?	Dichotomous, yes/no
5. During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?	Choices included 0–7 days High level –4–7 days/week Low level- ≤ 3 days/week
6. In an average week when you are in school, on how many days do you go to physical education (PE) classes?	Choices included 0–5 days High level- 4–5 days/week Low level-0-3 days/week
7. During the past 12 months, on how many sports teams did you play? (Include any teams run by your school or community groups.)	Choices included 0 teams, 1 team, 2 teams, 3 or more teams.

Table 2

Demographic and Baseline Characteristics

Variables	<i>n</i> (%)
Gender	
Female	82 (58.6)
Male	57 (40.7)
Ethnicity	
Hispanic	140 (100)
Age (years) Range	
7	56 (40.0)
8	20 (14.3)
9	28 (20.0)
10	24 (17.1)
11	11 (7.9)
Primary Language Spoken	
Spanish	73 (52.1)
English	67 (47.9)
Physical Activity	
Low	55 (39.3)
High	84 (60.0)
PE Class Attended ^b	
Low	65 (46.4)
High	74 (53.2)
Number of Sports Teams Participated	
0 teams	40 (40.3)
1 team	21.4 (21.5)
2 teams	14.3 (14.4)
3 or more teams	23.6 (23.7)
BMI Category (<i>N</i>= 130) ^{c, d}	
Normal Weight	79 (60.8)
Overweight	51 (39.2)

Note:

^a Number of days physically active for at least 60 minutes per day during the past 7 days (low = < 3 days/week; high = 4–7 days/week)

^b PE Class Attended (low = ≤ 3 days/week; High= 4–5 days/week)

^c Using clinical parameters of height and weight, BMI (weight [kg]/height [m]²), age-specific, and gender-specific percentiles based on growth charts developed by the Centers for Disease Control and Prevention.

^d Data were missing for 10 children for BMI category

PE = physical education, BMI = body mass index.

Table 3

Summary of Physical Activity, PE Class Attendance, and Number of Sports Teams Participated in by BMI and Grade Categories

Variable	BMI Category ^{d, e} (N = 130) n (%)		p value	Grade Category (N = 139) n (%)		p value
	Normal Weight	Overweight		Low (Grades 1–3)	High (Grades 4–5)	
Physical Activity ^b						
Low	36 (27.7)	16 (12.3)		38 (27.3)	17 (12.2)	
High	43 (33.1)	35 (26.9)	.14	31 (22.3)	53 (38.1)	.001
PE Class Attendance ^c						
Low	34 (26.2)	25 (19.2)		27 (41.5)	38 (58.5)	
High	45 (34.6)	26 (20.0)	.59	42 (56.8)	32 (43.2)	.05
Number of Sports Teams Participated in						
0 teams	36 (27.7)	17 (13.1)	.05	31 (22.3)	25 (18.0)	.23
1 team	19 (14.6)	9 (6.9)	.05	11 (7.9)	19 (13.7)	.27
2 teams	6 (4.6)	12 (9.2)	.05	8 (5.8)	12 (8.6)	.29
3 or more teams	18 (13.8)	13 (10.0)	.05	19 (13.7)	14 (10.1)	.30

^a p values obtained from the corresponding Pearson chi-square tests

^b Number of days physically active for at least 60 minutes per day during the past 7 days (low = ≤ 3 days/week; high = 4–7 days/week)

^c PE Class Attended (low = ≤ 3 days/week; High = 4–5 days/week)

^d Using clinical parameters of height and weight, BMI (weight [kg]/height [m]²), age-specific, and gender-specific percentiles based on growth charts developed by the Centers for Disease Control and Prevention.

^e Data were missing for 10 children for BMI category

PE = physical education, BMI = body mass index

Table 4**Educational Resources to Increase Physical Activity among Hispanic Children**

Resource	Website
American Academy of Pediatrics	http://www.aap.org/obesity/about.html
Kidnetic	http://www.kidnetic.com/BrightPapers/?c=Para+Padres
Let's Move	http://www.letsmove.gov/
My Pyramid/Mi Pirámide	http://www.mypyramid.gov/sp-index.html
National Council of La Raza	http://www.nclr.org/index.php/issues_and_programs/health_and_nutrition/
NHLBI- Latino Cardiovascular Health Resources	http://www.nhlbi.nih.gov/health/prof/heart/latino/lat_pat.htm
NHLBI We Can! (Ways to Enhance Children's Activity and Nutrition) Materials - Families Finding the Balance: A Parent Handbook-Spanish	http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan_mats/parent_hb_en.htm
The Pan American Health Organization (PAHO)	http://new.paho.org/hq/index.php?option=com_joomlabook&Itemid=259&task=display&id=234
SmallStep for Kids-Spanish	http://www.smallstep.gov/kids/flash/index.html

Table 5

Favorite Cultural Activity Games for Hispanic Children

Activity	Explanation
Las Cuatro Esquinas (Four corners)	Four players draw chalk boxes on four different corners of a large square. The fifth player stands in the middle and is "It." On his/her signal, the other four players race to stand in a different corner, while he tries to get there first. The player who ends up without a corner box is the new "It."
La Araña (The spider)	Players stand in two parallel lines about 10 feet from each other. The person who is "It" stands halfway between the lines. When It says "¡Araña!" ("Spider!") everybody has to cross to the opposite side. Any player that "It" touches becomes part of the spider, so they have to hold hands with "It" for the rest of the game. As more players get tagged, only the players at the end of the spider can tag. The game ends when everyone's been touched.
Tiente Envenenada (Poisoned tag)	One player is "It" and must chase the other players. Whoever he tags is the new "It," but must run with one hand holding the spot where she was tagged.

Source: Hispanic Heritage Month Games. The Library of Congress. Retrieved from <http://www.hispanicheritagemonth.gov/>.