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Risk Factors Contributing to Overweight, Decreased Physical Activity and Body Dissatisfaction in California Adolescents

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RISK FACTORS CONTRIBUTING TO OVERWEIGHT, DECREASED PHYSICAL ACTIVITY AND BODY DISSATISFACTION IN CALIFORNIA ADOLESCENTS

by

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DISSERTATION

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ABSTRACT

The purpose of this descriptive cross-sectional study is to examine the factors that contribute to overweight, decreased physical activity and body dissatisfaction in the 12 to 17 year old, ethnically diverse California adolescent and to determine if there are differences among gender and race. Data from the 2005 California Health Interview Survey (CHIS) for adolescents self-identified as Latino, Asian, or White were reviewed. Adolescents reported weight, height, gender, ethnicity, parent education attainment, household income, physical activity, sedentary activity, breakfast consumption, family meals and body satisfaction. Parent information was also used in exploring factors contributing to decreased physical activity and these variables included parent physical activity, acculturation level and BMI. The main findings in this study were that gender and ethnic variations exist in factors contributing to overweight, decreased physical activity and body dissatisfaction in California adolescents. The key factors associated with both overweight and PA included age, gender, ethnicity, SES, screen time, and parent education attainment. The key risk factors that overlapped for body dissatisfaction and PA included general health status and BMI. A higher percentage of Latino adolescents (38%) compared to 25% of whites and 16% of Asians were overweight. Females are 1.5 times as likely to report decreased levels of physical activity compared with males. Asians were the least active and also reported the highest levels of sedentary activity. Across gender and ethnicity reports of poor/fair general health status and overweight were associated with body dissatisfaction. Latina females and Asian males were the least satisfied with their bodies. Overall, there seems to be a relationship between overweight, decreased physical activity and body dissatisfaction in California

adolescents. The findings in this study support the need for development of culturally sensitive and gender specific interventions to improve the health behaviors in the adolescent population.

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Introduction to the Problem

"Childhood obesity is one of the most daunting health challenges of the 21st century" (U.S. Department of Health and Human Services, 2004, p.9) and it is unclear exactly what factors contribute to the increased prevalence. The term obesity and overweight are frequently used interchangeably in the literature describing childhood obesity, but they are distinct entities. Obesity indicates excess adipose tissue whereas overweight indicates excess weight for height regardless of the composition of the weight (Troiano & Flegal, 1999). Scientists in general further define obesity (overweight) in children as a body mass index (BMI) of $\geq 95^{th}$ percentile, at risk for overweight as a BMI of $\geq 85^{th}$ and $\leq 95^{th}$ percentile, and normal weight as a BMI of between the 5^{th} and 85^{th} percentile for children and adolescents of the same age and gender. It is estimated that currently approximately 16% of adolescent's age 12-19 years are obese, which according to the National Center for Health Statistics is a 45% increase from the 1994 National Health and Nutrition Examination Survey III (NHANES) (1988-94)(CDC, 2006a).

Nationally, Asian Americans as a whole are at lower risk for overweight (20.6%) than are African Americans (30.9%), Latinos (30.4%) and whites (24.2%). A similar trend is also found in California (Asian Americans, 11.3%; African Americans, 21.5%; Latinos, 24.4%; and Whites, 13.9%) (CHIS, 2009). However, second and third generation Asian American children have the largest and most significant increase in the incidence of overweight compared with first generation (Popkin,& Udry, 1998). Hispanic American adolescents show similar trends, with an increase from 24.5% to 31.7% for children born in the first generation compared to children born in the second

and third generation (Popkin, & Udry). Disparities in overweight prevalence exist both nationally and locally among minority adolescents, although the cause of these disparities are unclear (Ogden, Carroll, & Flegal, 2008).

Obesity tracks from adolescence into adulthood, approximately 70% of obese adolescents will be obese adults (Guo, Roche, Chumlea, Gardner & Siervogel, 1994; Guo, Wu, Chumlea & Roche, 2002). Adolescence is a key period for the development of various health risk factors including obesity. The most common conditions associated with primary childhood obesity include hypertension, early heart disease, diabetes (Atabek, Pirgon & Kurtoglu, 2006; Must, Bandini, Tybor, Phillips, Naumova, & Dietz, 2007; Rowland, 1999) as well as psychological ramifications including body dissatisfaction, depression (Goodman & Whitaker, 2002), weight-based teasing (Eisenberg, Neumark-Sztainer, & Story, 2003), and social isolation and discrimination (Latner & Stunkard, 2003) which have all been shown to have negative impact on self-esteem in obese youth (Eisenberg et al., 2003).

Several risk factors have been associated with obesity in adolescents including genetic factors, physical activity, sedentary activity, dietary intake, and acculturation (Burke, Beilin, Durkin, Stritzke, Houghton, & Cameron, 2006; Goldfield, Mallory, Parker, Cunningham, Legg, & Lumb, 2007). However, the current literature remains controversial in the causes of obesity in our youth and further research is need. Although interest in sustainable interventions to address the issue of childhood obesity have increased significantly in relation to the current epidemic, few studies have explored the ethnic disparities related to the factors that contribute to obesity in the adolescent. To prevent the long term adverse effects of obesity in a multi-ethnic society, obesity

prevention programs need to target the pre and early adolescents and be gender and culturally appropriate.

During adolescence, physical activity is recognized as playing an important role in the prevention of obesity (Ara, Vicente-Rodriquez & Perez-Gomez, 2006; Treuth, Hou, Young & Maynard, 2005), and in health promotion in general (Floriani & Kennedy, 2007). According to the International Obesity Task Force (2007), many countries, including the United States, are seeing an increased prevalence of inactivity among the early adolescent population, which has likely contributed to the current epidemic in childhood obesity (Hophepa, Schofield & Kolt, 2006, Telama, & Yang, 2000). Activity levels have been shown to drop as much as 50% during adolescence. An increase in sedentary behavior has been found to occur with age, beginning as early as 10 years (Kimm, Glynn, Kriska, Barton, Kronsberg & Daniels, 2002).

There seems to be a gap in the literature regarding adolescent physical activity. The American Dietetic Association (2006) summarized a body of literature pertaining to physical activity and its relationship to obesity. Sixty-four articles explored physical activity and childhood obesity from the primary (prevention), secondary (already overweight or at risk for overweight) and tertiary (overweight with co-morbidities) perspective. Of the 64 articles, 54 focused on the school age children, 6 focused on preschoolers and only 4 investigated the adolescent population (Delany, Bray, Harsha & Volaufova, 2004; Gordon-Larsen, Adair & Popkin, 2002; Kemper, Post, Twisk & van Mechelen, 1999; Kim, et al. 2002; Story, Forshee, Weaver & Sansalone, 2003). Delany (2004) found a negative association of physical activity with BMI in normal weight and obese adolescents (Age range 12.7 ± 0.1 y, $n = 114$, $R^2 = 0.70$, $p < .05$). Gordon-Larsen

(2002) used a national sample with 12,759 ethnically diverse adolescents and compared normal weight, at risk for overweight and overweight adolescents with hours of television/video and bouts of moderate or vigorous activity and found a positive association between increased BMI with increased inactivity (n = 12,759, white boys [OR = 1.52, 95% CI: 1.08 – 2.14], girls [OR = 2.45 95% CI: 1.51 -3.97). Across gender and ethnic groups a decrease odds (OR = 0.81 (0.76 – 0.87)) of obesity was associated with an increase in physical activity (greatest decrease in white boys). However, cross-sectional studies done by Story (2003) and Kemper (1999) showed no association between BMI and vigorous physical activity in a nationally representative adolescent population. More recently in a cross-sectional (N = 878) study Patrick and colleagues (2004), found that the only risk factor for increased BMI in 11-15 year old children was insufficient vigorous physical activity. Results also suggest that both girls and boys in the normal weight (BMI <85th percentile) group were doing significantly more minutes per day of vigorous physical activity than those in the "at risk for overweight (AR) and the "overweight" (OW) group (BMI > 85th percentile) (Girls OR = 0.93, Boys OR = 0.92). Although physical activity literature has not shown a consistent relationship with youth overweight status, Patrick's study showed a relationship in both boys and girls between vigorous physical activity and being overweight.

Body dissatisfaction has been linked to overweight as well as decreased physical activity participation across the lifespan. According to Brumberg (1997) 53% of American girls are unhappy with their bodies by age 13 and this number increases to 78% by the time girls reach the age of 17. Although there is less research related to boys and body satisfaction, the literature available indicates that many are dissatisfied with their

bodies and suffer similar negative psychological and health related consequences (Cafri, Thompson, Ricciardelli, McCabe, Smolak, & Yesalis, 2005; Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Prenell, Bearman, & Stice, 2004). According to the 2007 Youth Risk Behavior Survey (YRBS) approximately 34.5% of teen girls and 24.4% of teen boys were dissatisfied with their bodies (CDC, 2008). Ethnic differences reported in the area of body dissatisfaction have been found in the literature. Asian American and Latinos tend to be least satisfied with their bodies followed by whites, while African Americans are the least dissatisfied with their body (CDC, 2008; Yates, Edman, & Aruguette, 2004).

Negative outcomes associated with body dissatisfaction include higher BMI, eating disorders, low self-esteem, depression and decreased participation in physical activity (Daniels, 2004; Paxton, Eisenberg, & Neumark-Sztainer, 2006; Prenell, Bearman, & Stice, 2004; Taylor, Yancey, Leslie, Murray, Cummings, Sharkey, et al. 1999). Developmentally, adolescence is a time filled with many changes both physically and emotionally which may factor into body dissatisfaction in this age group making it an important area to explore in this population.

In order to explore the complex phenomenon of obesity, decreased physical activity and body dissatisfaction in Latino, Asian and White California adolescents, I chose to use the ecological model of Predictors of Childhood Obesity developed by Davison and Birch as my framework (Figure 5). In order to better understand the diverse etiologic underpinnings of childhood obesity, this model was developed based on the results of research assessing predictors of childhood overweight in combination with Ecologic Systems Theory (EST).

The emergence of the ecologic models for health has been brought to the forefront by the increased awareness by scientists and health care providers that the etiology of many of the current public health problems including childhood obesity, are jointly influenced by a myriad of diverse causative factors existing at multiple levels which are illustrated in this model. The EST conceptualizes human development from an interactive contextual perspective.

EST posits that an individual is embedded in an ecological niche, which includes the immediate environment (family/peers) but also the context in which the individual and their immediate environment are situated. The EST emphasizes an interactive contextual perspective which suggests a strong influence from environment and family in adolescent health behaviors.

Therefore, this proposed study explored the ethnic disparities in the area of obesity, physical activity and body dissatisfaction through secondary data analysis utilizing the 2005 California Health Interview Survey. The specific aim of this study is to examine factors related to high BMI (Figure 2), low levels of physical activity (Figure 3) and body dissatisfaction (Figure 4) in adolescents of three ethnic groups in California; age 12-17 (Caucasians, Latinos, and Asians). Children in early adolescence (12-14) are important to study because they are transitioning from concrete to abstract thinkers and becoming more independent individuals as they progress through adolescence which creates a rich time to introduce interventions to affect lifelong healthy behaviors.

Statement of the Problem

Obesity is a serious health issue and because of this obesity prevention should start in childhood as recommended by the Center for Disease Control and Prevention (CDC)

and the National Institute of Health (NIH). The NIH and Healthy People 2010 have set childhood obesity prevention as a research priority and one of the ten national objectives. This study is significant as it will examine obesity-related health issues in the White, Latino- and Asian-American adolescent. It is important to explore these ethnic groups because they are the two fastest growing minority groups in California. The current projections reveal that Hispanics are now expected to constitute the majority of Californians by 2042. By the middle of the century, the projections show that Hispanics will be 52 percent of the state's population, with Whites comprising 26 percent. Asians are expected to be 13 percent; Blacks, 5 percent; and Multirace persons, 2 percent. (State of California, 2007). Comparing White, Latino and Asian adolescents as well as obesity-related health behaviors will help to inform the development of culturally specific prevention and treatment interventions as well as help identify those adolescents most at risk for obesity.

Purpose of the Study

The purpose of this descriptive study was to investigate the factors that contribute to overweight status, physical activity and body dissatisfaction in White, Latino and Asian adolescents in California. Factors explored in this study include self-reported gender, age, ethnicity, physical activity, sedentary activity, general health, breakfast consumption, family meals, parental education attainment, parental physical activity, parent BMI, years parents living in U.S., and household income.

CHAPTER TWO

Literature Review and Conceptual Framework

Background and Purpose of Review

Over the last few decades the dramatically increasing prevalence of overweight and obese minority youth has contributed to poor health outcomes (Ogden, Carroll, Curtin, et al. 2006). In the past, overweight and obesity in individuals were often attributed primarily to genetic factors (National Institute for Health Care Management (NIHCM) 2003). However, this explanation seems implausible given that the genes of populations have not changed over the last 10 to 20 years, while obesity has rapidly increased.

The epidemic of obesity in children may best be explained by ecological systems theory, which posits that a complex interaction of factors including behavioral choices (diet and physical activity), myriad social representations of the body (body dissatisfaction/image), environmental influences (access to food choices, recreational facilities, built environment), and genetic predisposition underlie increasing obesity. The purpose of this chapter is to examine the literature relating to overweight, physical activity, and body dissatisfaction in ethnically diverse adolescents.

Being Overweight or Obese

The prevalence of overweight and obese children and adolescents in the United States is a major public health concern. According to the National Health and Nutrition Examination Survey (NHANES), 16.3 percent of children and adolescents ages 2-19 are overweight (CDC 2009). Ogden (2006) reports that 17.1 percent of children and

adolescents nationally are overweight; in California the rate is even higher (18.9%) (CHIS, 2007).

Health Consequences of Being Overweight/Obese

Some of the health consequences of being overweight include: hypertension, dyslipidemia, impaired glucose tolerance (IGT), and insulin resistance, which together constitute metabolic syndrome and predict onset of premature heart disease in our youth (Atabek, Pirgon & Kurtoglu 2006; Kieffer, Sinco, Meyer, et al. 2006). In addition, pulmonary complications including sleep apnea as well as increased incidence of asthma are associated with obesity (Kieffer et al.; Must, Bandini, Tybor, et al. 2007). Childhood obesity also contributes to growth acceleration (NIHCM 2003) and is thought to have an impact on the developing musculoskeletal system (Kortt & Baldry 2002; Wearing, Hennig, Byrne, et al. 2006).

Although an association between childhood obesity and cancer has not yet been explored, a link has been established between physical inactivity and increased risk of breast cancer in females as young as 12 years old (Ahlgren, Melbye, Wohlfahrt, et al. 2004; Delvin 2008). Certainly the high incidence of overweight children who grow up to be overweight adults likely places these children at increased risk for cancer and other diseases later in life (ACS 2007).

In addition to the many physical decrements tied to obesity, being overweight has a negative psychological impact as well (Must, et al. 2007). U.S. social norms place enormous pressure on children to conform to an “ideal” body shape and size. As a consequence, weight stigma, experienced as teasing and inequitable treatment, have the

potential to harm adolescents by increasing their body dissatisfaction, lowering self-esteem, causing eating behaviors, and threatening emotional well-being (Eisenberg, Neumark-Sztainer & Story 2003; Storch, Milson, DeBraganza, et al. 2007). The stigma associated with being overweight in a society that values thinness can be overwhelming especially in adolescents (King, Shapiro, Hebl, et al. 2006; Puhl & Brownell 2001).

Financial Burden of Being Overweight/Obese

Childhood obesity is also associated with an enormous financial burden in the U. S. and internationally. In the United States, it is estimated that $51.6 billion **annually (?)** will be spent on direct costs associated with treatment of the various co-morbidities described above. The indirect costs are estimated to be $47.6 billion annually, which represents income lost due to disability and decreased life expectancy. For the first time in American history, it is predicted that children will have shorter life expectancies than those of their parents (Brownell 2005).

RISK FACTORS OF BEING OVERWEIGHT/OBESE

RISK FACTORS FOR OVERWEIGHT (Figure 2)

Age/Gender/Ethnicity

Age**,** gender, and ethnic differences in overweight status are reported among adolescents. According to Ogden et al. (2006), 17 percent of U.S. children and adolescents are overweight. The highest prevalence of overweight/obesity is found among 6-11 year-olds, slightly decreasing in 12-19 year-olds to 36.5 percent vs 36.8 percent for boys, and to 38 percent vs. 31.7 percent for girls (NHANES 2003-2004).

Boys tend to be more obese than girls. Over the past ten years, there has been an increased prevalence overall of overweight in females from 13.3 percent to 16 percent, while in boys the increase in obesity increased from 14 percent to 18.2 percent. Latino and Asian American male adolescents are more likely to be overweight than Latino and Asian American females and white males (Ogden et al. 2006).

The Asian American population has grown nearly 73 percent over the past decade and 2/3 of that population were born outside of the U.S. After Hispanics, Asian Americans are the second fastest growing ethnic group in the United States (2000 U.S. Census report). Overall Asian Americans have a lower rate of obesity (20.6%) compared to Latinos (30.4%) and whites (24.2%). Interestingly, both Asian American and Hispanic adolescents born in the United States to immigrant parents have twice the risk of being overweight than foreign-born adolescents (Popkin & Udry 1998). Acculturation into the American lifestyle decreases PA and increases high fat food consumption, which results in increasing the risk for obesity among these ethnic minorities (Unger, Reynolds, Shakib, et al. 2004).

Socioeconomic Status

Socioeconomic status (SES) (which often encompasses adult educational attainment) and overweight status have been explored in the literature and variations have been discovered based on race (Gordan-Larsen, Adair, & Popkin 2003; Hass, Lee, Kaplan, et al. 2003). In general, the literature suggests that in industrialized and developing countries, high SES and educational attainment increase risk of being overweight compared to people with lower SES and educational attainment. Among

Caucasians in the United States, high SES and educational level is related to lower body mass index (BMI), which lowers risk for being overweight; low SES increases the risk for being overweight (Wang 2001; Wang, Monteiro, & Popkin 2002). According to Chen (2008), Asian-American woman with high SES are less likely to be overweight. This finding is also true in the Latino population, and is more pronounced in the female population (Scharoun-Lee, Adair, Kaufman, et al. 2009). While a high SES is protective for white females and lowers their risk of becoming overweight, the opposite is true in African American children. They have increased risk of overweight with higher SES (Wang & Zhang 2006). In the United States there is a higher prevalence of overweight in minorities with low SES (Ogden, Flegal, Carroll, et al. 2002; Paeratakul, Lovejoy, Ryan, et al. 2002).

Physical Activity (PA)

In recent years the public health benefits of reducing sedentary lifestyles and of promoting physical activity have become increasingly apparent (Amesty 2003; Gordon-Larsen, McMurray, & Popkin, 1999; USDHHS 2000). Healthy People 2010 emphasizes that regular participation in moderate PA is an essential component of a healthy lifestyle (USDHHS), and identifies PA as a leading health indicator. Regular PA has proven to enhance health (Amesty; Cavill, Biddle, et al. 2001) and reduce the risk of developing many chronic diseases among adults and all-cause mortality (Tergerson & King 2002). Nevertheless, many adults remain sedentary (Butte, Puyau, Adolph, et al. 2007). Although young people are more active than adults, many young people do not engage in the recommended levels of PA (Pate, Freedson, Sallis, Taylor, et al. 2002). In addition,

among adolescents, PA declines sharply with age (Babey, Diamant, Brown et al. 2005; Riddoch, Andersen, Wedderkopp, et al., 2004) and has gender- and ethnicity-specific variations (Babey 2005; Riddoch,2004; USDHHS,2000).

RISK FACTORS FOR INACTIVITY (Figure 3)

Factors related to PA in adolescents have been studied. Some of these factors include age, gender, ethnicity, sedentary activity level, general health status, and BMI. In addition, various factors pertaining to parents have also been linked to physical activity in children. These include SES, parents' participation in PA, parents' acculturation level, and parents' BMI. This section will examine various factors that have the potential to impact physical activity in California adolescents.

Gender/Age

Current research related to gender and physical activity participation, documents that females are consistently reported to be less involved in sports, exercise, and physical activity than males (Allison, Dwyer, & Makins 1999; Tergerson & King 2002). Trost et al. (2001) (using, CSA 7164) explored age and gender differences in objectively measured, physical activity in youth, grades 1-12 (n = 1110 students). They found that boys exhibited more sustained bouts of moderate/vigorous PA (MVPA) than girls, but a statistically significant gender difference was found only in grades 1-3 and 4-6.

In contrast to Trost (2001), the COMPASS study (Community-Based Study of Physical Activity, Lifestyle and Self-Esteem in Swedish Schoolchildren), involving 3000 15-year-olds living around Stockholm showed boys reported more physical activity

(78% > 60 minutes/day) than girls (64% > 60 minutes/day), which Lagerberg (2005) notes is a substantial gender difference.

During adolescence, physical activity (PA) is recognized as playing an important role in the prevention of obesity (Ara, Vicente-Rodriquez, & Perez-Gomez 2006; CDC 2006b, Treuth, Hou, Young et al. 2005), and in health promotion in general (Floriani & Kennedy 2007). According to the International Obesity Task Force (2007), many countries, including the United States, are seeing an increased prevalence of inactivity among the early adolescent population, which has likely contributed to the current epidemic in childhood obesity (Hophepa, Schofield & Kolt 2006, Telama, & Yang 2000). Epidemiologic evidence suggests that activity levels decline during the early teen years, especially in females (Pate, Davis, Robinson, et al. 2006; Sallis, Prochaska, & Taylor 2000). Increasing sedentary behavior with age has been reported as early as 10 years of age (Kimm, Glynn, Kriska, et al. 2002). In sum, increased PA, especially in adolescents, is essential for decreasing risk of being overweight in adulthood.

Ethnicity

In addition to gender and age, ethnicity accounts for variations in PA level. According to the National Survey of Children's Health 2003, 58.2 percent of Latino adolescents participate in moderate physical activity (> 3days/week) compared to 75.5 percent for Caucasians and 67.3 percent for Asian-Americans (Singh, Yu, Siahpush, et al. 2008). Similarly Healthy People 2010 found that Caucasians were more vigorously active (67%) than either Latinos (61%) or African Americans (56%) (Data for Asian adolescents was reported as statistically unreliable.) (USDHHS 2000). However, Latino

adolescents participated more in daily school physical activity than either African American adolescents (29%) or whites (28%) (Data for Asian adolescents was reported as statistically unreliable.) (USDHHS 2000).

CHIS 2003 data report that 76.4 percent of whites, 68.1 percent of Latinos, but only 62.3 percent of Asians participate in regular PA, and similarly, that 9.5 percent of Latinos, and 8.3 percent of Asian Americans report engaging in no physical activity, but only 4.1 percent of whites do so (Babey, Diamant, Brown, et al. 2005).

The variation between whites and Latinos and Asian Americans may be accounted for by the fact that a greater number of Caucasian adolescents participate in extracurricular and/or organized sports outside of school, which may exempt them from taking PE in school. Although Latino adolescents report less participation in PA than whites, more of them (41%) report being physically active in PE classes than do Caucasians (40%) or African Americans (32%) (USDHHS 2000) These data suggest that Latino adolescents spend less or no time participating in leisure-time physical activity (Amesty 2003), but more time in organized physical education programs. Thus, the most effective intervention for increasing PA among Latino adolescents may be school-based programs.

SES

There is strong evidence of a significant decline in the level of physical activity during early adolescence, particularly among poor people (Crespo, Smit, Anderson, et al. 2000; Juniu 2000; Kimm, Glynn, Kriska, et al., 2002). In the social ecological model, SES plays an important role in shaping the social or community context in which the

adolescent is nested. According to Woodfield et al. (2002), adolescents who are considered to be lower SES participate in less physical activity than adolescents of higher SES. Although the association between SES and physical activity is clear, it is less clear what factors within lower SES populations might contribute to the observed declines in PA. Perhaps adolescents of low SES—who may want to engage in PA-- lack the resources such as parks, recreation facilities, or money to do so (Humbert, Chad, Spink, et al. 2006).

Screen time/Sedentary Behavior

It is important to mention that a key factor associated with physical activity and its relationship to being overweight or obese is physical inactivity or sedentary behavior. There is a growing body of literature about sedentary behavior (most of it focusing on television viewing), that merits some attention. Healthy People 2010, Objective 22-11 addressed the growing number of hours adolescents devote to watching television on school days. Viewership progressively increases with grade level (49% in 9^{th} grade, 54% in 10^{th} grade, 62% in 11^{th} grade, & 67% in 12^{th} grade) respectively (U.S. Department of Human Services). Studies show that teens age 12-17 watch an average of 14.1 hours of television per week (Luke, Philpott, Brett, et al. 2004; Roberts, Foehr, & Rideout 2005).

Must (2007) conducted a longitudinal study over four years among participants who were an average age of 10 at baseline, and 17 at exit that explored the relationship between screen viewing time and BMI and the changes that occur with increasing age. In contrast to the USDHH findings, Must found that baseline screen time averaged 3.4 hours per day (2.4 SD), and exit screen time mean decreased significantly ($p < 0.001$) to 1.81

hours per day (1.5). (The sample (n = 173) was comprised only of females. Seventy-five percent were white, 14 percent were black, and 11 percent were other race/ethnicity.)

Very often, the remedy proposed for decreasing television viewing time among adolescents is increasing participation in PA. Khunti and colleagues (2007) found that 46 percent of secondary school children in the UK watch > 4 hours of television/day. The UK Group recommendation of accumulating 60 minutes per day of moderate intensity PA ($\geq$ 60 min., $\geq$ 5 days/week, $\geq$ 3 METS) was supported as the best existing guideline for youth (Pate, et al. 2002; USDA 2005). Strong's (2005) systematic literature review, which included 850 articles, also supports the recommendation of participation in moderate to vigorous physical activity that is enjoyable and developmentally appropriate for all school-age youth.

Increased BMI

Inconsistencies have been found in the literature regarding adolescent physical activity and obesity. The American Dietetic Association (2006) summarized a body of literature pertaining to physical activity and its relationship to obesity. Sixty-four articles explored physical activity and childhood obesity from the primary (prevention), secondary (already overweight or at risk for overweight), and tertiary (overweight with co-morbidities) perspective. Of the 64 articles, 54 focused on school age children, 6 focused on preschoolers, and only 4 investigated the adolescent population.

Delany (2004) found a negative association of PA with BMI in normal weight and obese adolescents. Gordon-Larsen (2002) used a national sample with 12,759 ethnically diverse adolescents and compared adolescents of normal weight, those at risk

for being overweight, and overweight adolescents relative to the number of hours of television/video they watched, and to the amount of moderate or vigorous activity they engaged in. They found a positive association between increased BMI and increased inactivity.

More recently in a cross-sectional (N = 878) study by Patrick (2004), which examined dietary and PA factors in 11-15 year-old-boys and girls in relation to their BMI. Insufficient vigorous physical activity was the only risk factor for increased BMI that he found.. Results suggest that both girls and boys in the normal group weight (BMI $<85^{th}$ percentile) engaged in significantly more minutes per day of vigorous physical activity than those in the "at risk for overweight (AR) and the "overweight" (OW) group (BMI $> 85^{th}$ percentile) ($p < .001$). However, only boys showed a statistical difference between groups for minutes per day of moderate physical activity ($p = .02$). However cross-sectional studies done by Story (2003) and Kemper (1999), (in a nationally representative adolescent population) showed no association between BMI and vigorous PA. Because the PA literature does not show a consistent relationship between PA and being overweight in adolescents, or between PA and gender and/or ethnicity, future research is needed to explore the complex phenomenon of overweight and PA by gender and ethnicity.

Acculturation

First and second generation immigrants make up the fastest growing portion of the U.S. child population. For Latino and Asian immigrants certain health outcomes (weight status, activity level) have been shown to be better in first generation immigrants

despite the various disadvantages they face (low SES, limited access to care) (Gordon-Larsen, Adair, et al. 2003). Gordon-Larsen, Harris, Ward et al. (2003) have shown that the "relative advantage of first-generation immigrants declines with length of residence in the U.S." (p. 2024).

Acculturation has been shown to influence physical activity among Latino and Asian adolescents. Unger (2004) explored the associations among level of acculturation, physical activity, and fast-food consumption among first- and second-generation Latino and Asian adolescents**.** She found that acculturation to the U. S. (Assessed in 6^{th} grade, N = 1385 Hispanic American; N = 619 Asian American) was significantly associated with decreased frequency of physical activity ($B = -.089$, $p < .001$) and increased frequency of fast-food consumption ($B = .078$, $p < .001$) in 7^{th} grade. This finding was consistent across ethnicities and gender, supporting earlier research that found a positive correlation between acculturation and unhealthy risk behaviors in adolescents. A cross-sectional study using the 2003 National Survey of Children's Health (n = 68,288) for children 6-17 years concluded that immigrant children across ethnic minority groups had greater rates of decreased PA and less sports participation than native children (Singh, Yu, Siahpush, et al. 2008).

Chen and Kennedy (2005) found a positive relationship between low level of maternal acculturation and increased risk for being overweight, although PA was not explored. In a study by Everson (2004), first-generation Latina immigrants, ages 20-50 years old, were examined to determine the association between acculturation and physical activity. Latinas with more English language proficiency, a component of acculturation, were more likely to be physically active than women with lower English language

proficiency. These findings were also true among first-generation immigrants who came to the U.S. before age 25, but they did not hold true for Latina immigrants who arrived in the U.S. after 25 years of age. Studies that explore the relationship between acculturation levels of Latino and Asian parents or the impact of the family, in general (unrelated to level of acculturation) and levels of physical activity among adolescent children, are absent in the current literature.

Parents' Level of Physical Activity

To promote physical activity as a strategy for a healthy lifestyle and for preventing weight gain in adolescents, a better understanding of factors that influence participation in physical activity in youth must be explored. In general the most important factors for both boys and girls include peer and family support such as having a friend to exercise with or one who encourages exercise, and having a parent who is physically active and/or encourages PA.

Zabinski (2003) explores the possibility that adolescents of different weights are likely to face different motivators for or barriers to physical activity. Zabinski's key barriers included lack of time due to academic obligations, lack of interest, presence of environmental barriers (weather, no access), and body dissatisfaction (especially in females). Sallis and colleagues (2000) performed a comprehensive review of correlates of PA for adolescents (13-18), which included 48 variables from 54 studies. Their findings indicate that, among community samples of children across the weight spectrum, parental support seems to have a positive impact on adolescent PA, and is related to greater participation in physical activity among older children (Sallis, Prochaska, & Taylor 2000).

Adolescence is a time when families critically influence their children's health behaviors including physical activity (Davison, Cutting, & Birch 2003; McGuire, Hannan, Neumark-Sztainer, et al. 2002; Ornelas, Perreira, & Ayala 2007). Parent modeling of physical activity has been shown to positively influence adolescents' physical activity levels throughout adolescence (Madsen, McCulloch, & Crawford 2009; Welk, Wood, & Morss 2003). Parent behavior is a potential focus for developing interventions to impact physical activity levels in teens.

It is unclear whether overweight children perceive less support for physical activity from peers and parents due to the stigmatization and social isolation associated with being overweight (Puhl & Latner 2007). The family is the most proximal environment and, as a result, has potentially the greatest influence on the behavior of children. However, the relationship between adolescent PA and parent PA in various ethnicities (Latino and Asian) and between boys and girls is unexamined in the literature.

Regular Breakfast Consumption

In addition to decreases in PA, nationally representative samples of U.S. adolescents show a decline in breakfast consumption over the past three decades (Siega-Riz, Popkin, & Carson 1998). Approximately 12 percent to 34 percent of adolescents regularly skip breakfast, and this rate increases with age (Timlin, Pereira, Story, et al. 2008). Cross-sectional as well as longitudinal studies have found that overweight children tend to eat breakfast less frequently than normal-weight children, and when overweight children do eat breakfast they tend to eat foods that provide lower energy intake and fewer nutrients (Berkey, Rockett, Gillman, et al. 2003; Timlin et al. 2008).

According to Keski-Rahkonen et al. (2003), skipping breakfast may be a risk factor for weight gain because children that skip breakfast have the tendency to snack, skip lunch, and lead a sedentary lifestyle.

Body Dissatisfaction

Body dissatisfaction is defined as how an individual perceives his/her body. These perceptions vary by age, gender, race, and BMI. Body dissatisfaction is a phenomenon that exists throughout the lifespan but is often more prevalent during adolescence due to the dramatic physical and psychological transformation that occurs during this developmental stage (Miller 2002). In the teen years body satisfaction impacts adolescents personally, and shapes relationships within the family, among friends, with peers at school, and globally through societal expectations (Davison & Birch 2001).

RISK FACTORS FOR BODY DISSATISFACTION (Figure 4)

Age/Gender

Body dissatisfaction can begin at a young age and increase with time and exposure to societal influences (media, peers, family) (Swallen, Reither, Hass, et al. 2005). Gender differences have been found in the prevalence of body dissatisfaction. Although more males are considered overweight than females, a higher percentage of females are dissatisfied with their bodies (Jones, Fries, & Danish 2007). Reports show that more than 50 percent of early adolescent girls (age 13 years) are unhappy with their bodies, and this increases substantially to 78 percent by the time they reach the age of 17 (Brumberg 1997). The 2007 Youth Risk Behavior Survey (YRBS) also supports these

findings. It reports that 34.5 percent of adolescent girls and 24.2 percent of boys express dissatisfaction with their bodies (CDC 2008). Females tend to have more psychological problems related to their weight including body dissatisfaction and depression than males, but research exploring body dissatisfaction in boys has documented negative emotional and physical outcomes among them as well (Cafri, Thompson, Ricciardelli, et al. 2005; Martyn-Nemeth, Penckofer, Gulanick, et al. 2009; Neumark-Sztainer, Story, Hannan, et al. 2002; Presnell, Bearman, & Stice 2004).

Ethnicity

Current research also points to differences in body dissatisfaction based on ethnicity. African American adolescents are less likely to be dissatisfied with their body compared to white adolescent girls (Jones, Fries, & Danish 2007; Neff, Sargent, McKeown, et al. 1997). Neumark-Sztainer et al. (2002) reported ethnic differences related to perceptions about weight in 4,746 adolescents. White girls reported more body dissatisfaction than African American girls, while Latino and Asian girls tended to report the most body dissatisfaction. Similarly, non-white adolescent boys reported more body dissatisfaction than white adolescent boys.

Weight Status

Although body dissatisfaction is often higher in overweight and obese adolescents, a fair number of normal-weight adolescents also report body dissatisfaction. The YRBS (2007) documented differences in reported body dissatisfaction among normal weight (34.5%) and overweight (60.3 %) girls and boys (24.2% vs. 30.4%). These findings

suggest that a fair number of adolescents try to lose weight in the absence of reported body dissatisfaction (CDC 2008).

Yates, Edman, and Aruguete (2004) studied ethnic differences in BMI and body dissatisfaction (n = 821) among whites and Asians. Yates, et al. found a high correlation between BMI and body dissatisfaction for males (r= .600; p<.001) and females (r= .610; p < .001). However, highly significant BMI/ethnic group differences were discovered. For example, among all Asian subgroups, higher BMIs correlated with higher body dissatisfaction. The exceptions were white males and African American females who were less dissatisfied with their body despite having higher BMIs. Asian males had the highest BMIs and were highly dissatisfied with their bodies, mirroring a female pattern of strong body dissatisfaction and a desire for a smaller body. Asian subgroups showed differences among females. Chinese females with low BMIs were highly satisfied with their bodies, while low-BMI Japanese females were highly dissatisfied with their bodies. Latino adolescents with high BMIs also report body dissatisfaction. Males and females considered overweight (85-95th percentile) were 1.5 times more likely to be dissatisfied with their bodies. Latino males were twice as likely, and Latino females were 3.5 times more likely, to report body dissatisfaction if their BMI was > 95th percentile (obese) (Mirza, Davis, & Yanovski 2005).

Physical Activity

Deforche (2006) describes the attitudes about physical activity among normal-weight, overweight and obese adolescents (n=89). She found that the factors associated with engaging in physical activity varied significantly in regard to “pleasure”, “looking

better," and "losing weight." Normal-weight adolescents rated "pleasure" as the most important factor, while "looking better" and "losing weight" were rated higher among overweight and obese adolescents. A five-year longitudinal study exploring the relationship between body satisfaction and health behaviors including PA found that males and females reported more PA if they also reported low body dissatisfaction. The mean hours/week of PA for females with low-body dissatisfaction was 4.42 versus 3.92 hours/week for those reporting high-body dissatisfaction. Males who reported low-body dissatisfaction reported 6.67 hours/week versus 5.72 hours/week with reported high-body dissatisfaction.

Frost and McKelvie (2005) used a questionnaire to collect data on the relationship between body satisfaction and activity level in high school adolescents (n =46). Their findings indicated that males who rated themselves as physically active had less body dissatisfaction than their counterparts, who reported low levels of physical activity. In contrast, both highly active and sedentary females reported having high levels of body dissatisfaction. These findings suggest that body satisfaction makes a difference in levels of physical activity, especially in males, and that we need to be concerned about the high prevalence of adolescents who express body dissatisfaction.

CONCEPTUAL FRAMEWORK: THE ECOLOLGICAL SYSTEMS THEORY

Overview of Model

In order to guide my examination of obesity, physical activity, and body dissatisfaction in Latino, Asian, and white adolescents in California, I used the social ecological model, which incorporates a multilevel approach. The emergence of ecological

models of health have been ignited by the increased awareness among scientists and health care providers that the etiology of many current public health problems facing the U.S. are influenced by myriad diverse causative factors existing at multiple levels of analysis.

A better understanding of the "diverse etiologic underpinnings" is necessary to develop interventions to remedy overweight, inactivity, and body dissatisfaction (Abrams, 2006; Best, Stokols, Green, et al. 2003; Glass & McAtee 2006; Stokols, Grzywacz, McMahan, et al. 2003). For this reason I chose "The Ecological Model of Childhood Obesity" by Davison and Birch (2001) as an ideal framework to support the research in this dissertation. This model was derived from Ecological Systems Theory (EST), which is a metatheory that encompasses many specific models and theories of health behavior, which are deemed to influence behavior at multiple levels and bidirectionally (Schneider& Stokols 2009). "Ecological models posit that constituents (intra- and extra-individuals) are interdependent and can exert direct effects on each other…if a change is made at one level of influence, all other levels may be affected" (Spence & Lee 2003, p. 9). EST has been used as a conceptual framework for numerous empirical studies in the area of childhood and adolescent obesity. EST conceptualizes the individual embedded in an ecological niche that includes the immediate environment and also the context in which the individual and his/her immediate environment is situated. The EST emphasizes an interactive, contextual perspective that suggests that an adolescent's health behaviors are strongly influenced by the environment and the family. According to the EST, ecological characteristics include child characteristics, which are nested within parent/family characteristics and further nested within community/social characteristics.

A bidirectional interaction occurs between the adolescent and family, which are influenced by the community and societal factors. This dissertation uses this framework with the understanding that adolescent obesity is a health issue that includes multiple levels of risk factors and, as a result, must be addressed with a multidirectional and individual approach.

The independent variables selected to use in this research project were based on the ecological model for childhood obesity put forth by Davison and Birch (2001). Variables were selected at the microsystem level, or intrapersonal /individual level (age, gender, BMI, level of body dissatisfaction, physical activity level, sedentary activity level, and breakfast consumption), the mesosystem level, which includes interpersonal and parent/family factors (SES, parents' level of education, parents' level of physical activity, BMI, and family meals) and the exosystem or community level (acculturation) (Figure 5). My hypothesis prior to starting the research was that obesity, decreased physical activity, and body dissatisfaction had multifactorial causes and that some of the factors overlapped among the three outcomes (Figure 3).

Assumptions/Research Questions

The dissertation attempted to answer the following research questions:

1. What are the factors related to increased BMI in adolescents age 12-17 in the CHIS Study?
    a. What is the relationship between physical activity, lack of activity, breakfast consumption, family meals, age, gender, and ethnicity,

parents' level of education, household income, and BMI in adolescents in the CHIS study?

b. What is the relationship between physical activity, lack of activity, breakfast consumption, family meals, age, parental education, household income, and BMI when comparing males with females and whites with Latinos and Asians .

c. What are the contributing factors to increased BMI specific to gender and ethnicity of the adolescent in the CHIS study?

2. What are the factors related to physical activity levels in adolescents age 12-17 in the CHIS study?

a. What is the relationship between physical activity in adolescents and the lack of activity, gender, age, ethnicity, household income, and general health of the adolescent?

b. What is the effect of parents' physical activity, parents' education level, parents' number of years living in the U.S. (minority parents), and parents' BMI on physical activity in the adolescent controlling for gender and ethnicity?

c. What specific factors contribute to increased amounts of physical activity in white, Latino- and Asian-American adolescents?

3. What are the factors related to body dissatisfaction in adolescents 12-17 in the CHIS study?

a. What is the relationship between body dissatisfaction and general health status, physical activity, sedentary activity, gender, ethnicity and BMI in, adolescents in the CHIS study?
b. What factors contribute to body dissatisfaction in White, Latino-, and Asian-American adolescent based on gender?

Definition of Terms

Overweight and at Risk for Overweight

The terms obesity and overweight are frequently used interchangeably in the literature to describe childhood obesity, but they have distinct meanings. Obesity indicates excess adipose tissue, whereas overweight indicates excess weight for height, regardless of the composition of the weight (Troiano & Flegal 1999). Generally, researchers define overweight for children and adolescents of the same age and gender as a body mass index (BMI) as more than or equal to the 95th percentile, at risk for overweight as a BMI as between the 85th and 95th percentile, and normal weight as a BMI of between the 5th percentile and the 85th percentile. In this study overweight was defined as having a body mass index (BMI) at or above the 95th percentile for gender and age, according to the 2000 BMI-for-age growth charts from the NHANES.

Physical Activity

The term physical activity is defined as bodily movement produced by the skeletal muscles that expend energy beyond resting levels. It includes occupational activities (walking, sweeping, lifting), transportation (walking or biking to school), recreational

activities (soccer, skating, running) and exercise (Ward, Saunders, & Pate 2007). Physical activity was measured in this study by combining the number of weekday and weekend days that adolescents participated in ≥ to 60 minutes of moderate physical activity. Adolescents who participated in ≥ 3 days were considered active, and those who reported < 3days of activity were considered inactive.

Body Dissatisfaction

"Body image is a multifaceted construct comprising cognitive, affective and behavioral components. Within this framework, body dissatisfaction is defined as the affective component of body image, or how an individual feels about his/her body" (Duncan, Al-Nakeeb, Nevill, & Jones 2006, p. 89). Body dissatisfaction was measured by combining responses to four questions related to body satisfaction: (1) Would you say you are very underweight, slightly underweight, about the right weight, slightly overweight, or very overweight? (2) Are you currently trying to change your weight? (3) Have you dieted in the last week? And (4) Have you exercised to lose or gain weight? Low scores (0-2 indicated body satisfaction; high scores (>2 indicated body dissatisfaction).

CHAPTER THREE

Methodology

Overview

The California Health Interview Survey (CHIS) was implemented in 2001 to determine the prevalence of and trends in health-related behaviors in adults, adolescents, and children in California. The CHIS is the largest health survey in the nation and is a model for other states that are developing population-based tools for monitoring public health. The CHIS provides a mechanism for obtaining ongoing public health data for the state, counties, and different ethnic groups in California.

The survey data collection was conducted by the University of California, Los Angeles, Center for Health Policy and Research in conjunction with the California Department of Health Services and the Public Health Institute. The goal of the CHIS is to provide health-related estimates for the population for California.

The CHIS is a cross-sectional, biennial health survey in California. Information collected in the CHIS 2005, which was used for this dissertation, included information about healthy and unhealthy behaviors such as exposure to potential risk factors and dietary intake and physiologic measures (height and weight), utilization of health care services, incidence and prevalence of disease, and other health-related factors such as physical activity.

Sampling Design

The sample design for the CHIS is complex, requiring weighting to make accurate population estimates. The CHIS sample was designed to yield estimates for most

counties in California and for the state's major ethnic and racial groups. For 2005, specific ethnic groups were purposefully over-sampled (Korean and Vietnamese). The calculation involved over-sampling particular ethnic surnames drawn from number in the telephone directory.

Data Collection

In an attempt to better represent the population, CHIS data are collected in five languages. The languages were selected based on data from the 2000 census, which identified the five languages spoken by the largest number of Californians. Survey data were collected by using a multistage random digit-dial telephone survey, with sampling from 41 counties in California. Data were directly input into computers during the interview process to minimize losing data. In the randomly selected households, if there was an adolescent (12-17 years old) and/or a child (<12 years old), one adolescent and one child were randomly selected; the adolescents were interviewed directly after consent for participation was obtained from the parents. Data were collected on 4,029 adolescents.

Response Rates

To maximize response rates, letters explaining the survey procedure were sent to 67 percent of the sampled randomly selected telephone numbers. The household extended interview (interview with parent and at least one child/adolescent) response rate was 59.3 percent, which is comparable to other random digit-dial surveys.

Study Variables

Based on the Ecologic Systems Theory described in Chapter 2 the following variables were selected to examine.

Outcome Variables

Overweight Status

Adolescent self-reported height and weight, and then BMI were calculated (BMI= weight in kilograms divided by height in meters squared). This variable was created by taking the self-reported height and weight for each participant and then using the BMI to determine age- and gender-specific percentiles for the BMI. BMI < 85^{th} percentile was considered "normal" and BMI $\geq$ 85^{th} percentile was considered overweight, based on the CDCs criteria from 2000 (CDC 2009a).

Physical Activity

Participating adolescents were asked how many days in the last week they had been physically active during the weekdays and weekends. It is important to obtain data for both times of the week because, among adolescents, activity levels have the potential to vary greatly between weekdays and weekends. The number of days that the adolescent participated in PA $\geq$ 60 minutes/day was tallied. Based on the American Academy of Pediatrics recommendation a dichotomous variable was created. Adolescents who were active $\geq$ 3 days/week were considered to be active; those who were active less than 3 days/week were considered to be sedentary.

Body Satisfaction

A body satisfaction score was created by combining four questions related to body image. Responses to questions that indicated dissatisfaction with one's body or indicated a desire to change one's body were scored as one. When adolescents indicated satisfaction with their body and no desire to change their current shape, they were scored as zero. Scores ranging from 0-2 indicated body satisfaction; scores > 2 indicated body dissatisfaction.

Demographic Variables

Several variables were examined related to demographics including gender, age, self-identified ethnicity, socioeconomic status, and parents' education level.

Breakfast consumption/Family Meals

Adolescents were asked how many days in the past week they had eaten breakfast. Based on current recommendations of the American Academy of Pediatrics if they reported 0-6 days/week, they were scored as not eating breakfast daily; if they reported eating breakfast more than 6 days they were considered to be daily breakfast eaters.

Family Meals

Family meals involved eating with a parent or guardian and were coded similarly to breakfast consumption.

Screen Viewing Time

Screen viewing time was calculated daily. Adolescents were asked four different questions related to screen time: how many hours per day they watched television or played video games during weekdays, how many on weekends, and then the same questions for computer time (non-school related). These four questions were combined to create a new variable that represented overall screen viewing time for each adolescent.

General Health Status

Adolescents were asked to assess their general health status by responding to the question "In general, would you say your health is excellent, very good, good, fair, or poor?" This measure was evaluated on a scale of 1 to 5, with 5 representing excellent. Chronic diseases (asthma and diabetes) were considered when analyzing adolescents' general health status.

Adolescent BMI (categorical)

For the examination of body dissatisfaction in the dissertation, I used a categorical variable for BMI. The rationale for doing so was to allow testing for a quadratic effect for BMI and body dissatisfaction. It was hypothesized that very low BMI and very high BMI would be associated with body dissatisfaction. A quadratic effect was not noted, and a linear relationship was found between BMI and body dissatisfaction.

Parents' PA

In order to explore the impact of parents' activity levels on adolescent PA, the relevant data pertaining to parents were linked with those of adolescent children. Parents were asked how many minutes they participated in moderate and/or vigorous PA in their free time on an average day. From this information a variable was created adding minutes/week. Parents participating in < 150 minutes/week did not meet PA recommendation; parents participating in > 150 minutes/week were considered to meet the recommendation of 30 minutes/day, 5 days per week.

Parents' Level of Acculturation

In order to assess acculturation level, parents were also asked how long they had lived in the United States. If parents reported living in the U.S. less than 5 years, they were considered unacculturated; if they reported living in the U.S. more than 5 years, they were considered acculturated. Previous research suggests that this cut-off point is a reasonable estimate of acculturation level.

Parents' BMI

Parents' BMI was assessed using the CDC's recommendation of 0 – 18.49 = underweight, 18-5 – 24.99 = normal weight, 25.29 – 29.99 = overweight, $\geq$ 30 = obese.

Statistical Analysis

In order to represent the study population, 80 replicate weights and a final weight variable were used to generate descriptive and logistic regression statistics. For the

continuous variables, means and standard errors were calculated, and for the categorical and dichotomous variables, frequency and percentages were obtained.

Because this study examined risk factors for the outcomes of being overweight and inactive and having body dissatisfaction, I created them as dichotomous variables. Univariate logistic regression was used for each independent variable. The relationships between these independent variables and each of the outcome variables were examined through alternate strategies including contingency tables and chi-square statistics.

Multivariate logistic regression was then performed to examine the interrelationship between the independent variables simultaneously and the outcome variables. Although not all the independent variables were found to significantly contribute to the variance in the overall multiple logistic regression model, all variables were left in the second model, which controlled for gender and ethnicity so that disparities could be explored. Potential interactions were tested as well as quadratic effects although none were determined to be statistically significant. All statistics were computed using STATA version 10 and SPSS Complex Survey to accommodate weighting variables.

CHAPTER FOUR

GENDER AND ETHNIC DISPARITIES CONTRIBUTING TO OVERWEIGHT IN CALIFORNIA ADOLESCENTS

Submitted to Journal of Social Science and Medicine

Abstract

Purpose: To explore differences in health behaviors and factors contributing to overweight among 12 to17 year olds in California.
Methods: Data from the 2005 California Health Interview Survey for 3315 adolescents self-identified as Latino, Asian, or white were reviewed. Adolescents reported their weight, height, gender, ethnicity, parents' educational level, household income, physical activity, sedentary activity, breakfast consumption, and family meals.
Results: Overall 34% of boys and 22% of girls in this study were overweight (>85th percentile for age and gender). Approximately 38% of Latinos, 25% of whites, and 16% of Asians were overweight. Latinos were more than twice as likely to be overweight as whites (2.07) and Asians (2.53). Younger adolescents (12-13 years old) and adolescents whose family income is less than 200% of the federal poverty level were more likely to be overweight. Low level of parental education is a risk factor for Latino and Asian girls and white and Latino boys. White girls with a lower socioeconomic status and white boys with more than 2 hours daily of television, video, and computer time were more likely to be overweight.
Conclusion: Results suggest gender and ethnic variations in factors that contribute to overweight in California adolescents. To influence the current overweight epidemic, clinicians must develop culturally sensitive and gender-specific interventions that address the unique needs of an ethnically diverse adolescent population.

Key Words: Adolescent obesity ethnic gender

Introduction

The prevalence of obesity remains a health concern for children and adolescents in the United States. During the combined years of 2003 to 2006, an estimated 16.3% of children and adolescents from 2 to 19 years old were overweight, at or above the 95th percentile body mass index (BMI)-for-age growth charts from the National Health and Nutrition Examination Survey determined in 2000 (CDC, 2009). Nationally, 17.1% of children and adolescents are overweight,(Ogden, Carroll, Curtin, McDowell, Tabak, Flegal, et al. 2006) and these rates are even higher in California (18.9%) (AskCHIS, 2009). Health consequences of overweight in adolescents, including early heart disease, diabetes, and psychological ramifications such as teasing, discrimination, and victimization make prevention a priority.(Atabek, Pirgon, & Kurtoglu, 2006; Must, Bandini, Tybor, Phillips, Naumova, & Dietz, 2007; Rowland, 1999).

Nationally, Asian Americans as a whole are at lower risk for overweight (20.6%) than are African Americans (30.9%), Latinos (30.4%), and whites (24.2%). A similar trend is also found in California (Asian Americans, 11.3%; African Americans, 21.5%; Latinos, 24.4%; and whites, 13.9%) (AskCHIS). However, according to the National Longitudinal Study of Adolescent Health, with an increase from 11.6% to 28%, Asian American children born in the second and third generation have the largest and most significant increase in the incidence of overweight compared with children born in the first generation (Popkin, & Udry, 1998). Similar trends were found in Hispanic American adolescents, with an increase from 24.5% to 31.7% from the first generation to the second and third generation (Popkin, & Udry). Thus disparities exist among

overweight prevalence, especially among minority adolescents, yet the causes of these disparities are unclear (Ogden, Carroll, & Flegal, 2008).

Several theories have been used and proposed to examine childhood obesity, including the ecological systems theory. The basic premise of the ecological systems theory is that individuals and their environment have a dynamic interaction and relational nature (Laustsen, 2006; Davision, & Birch, 2001). Ecological models of health behavior focus on individual influences such as physical activity and sedentary activity, as well as on social (family meals) and environmental factors (access to parks and bike and hiking trails) that may facilitate or inhibit individual behavior (Sallis, & Owen, 1997). Possible causes of ethnic differences in weight include socioeconomic status(Drewnowski, & Damon, 2005), gender, education level of parents, consumption of breakfast, family meals(Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003; Woodruff, & Hanning, 2009), amount of sedentary activity, and amount of physical activity (Nader, Bradley, Houts, McRitchie, & O'Brien, 2008). The literature supports the multifactoral nature of obesity, and the ecological model supports the multiple levels of influence that determine individual behavior. In this study, the ecological model was used to examine factors (including variables mentioned in the model) related to overweight in adolescents in California.

Latinos and Asian Americans are rapidly growing populations of immigrants in California and in the United States. A better understanding of overweight-related health behaviors and sociocultural differences among Latino, Asian American, and white adolescents in California will help in developing culturally sensitive interventions directed at the overweight epidemic. Thus the purpose of this study was to use the 2005

CHIS data to explore differences in overweight-related health behaviors between genders and among ethnicities in an effort to understand better the factors that contribute to overweight in 12 to 17 year olds in California.

Methods

Overview

The California Health Interview Survey (CHIS) 2005 was implemented to determine the prevalence of and trends in health-related behaviors among adults (n = 43,020), adolescents (n = 4,029), and children (n = 11,358) in California (CHIS, 2007; Lopez-Zetina, Lee, & Fries, 2006). The present analysis reports findings related to the population of 12 to 17 year olds in California. The CHIS is the largest health survey in the nation and is a model for other states that are developing population-based tools for monitoring public health (Holtby, Zahnd, Chia, Lordi, Grant, & Rao, 2008). The CHIS is recognized as an essential source of ongoing public health data for the state, counties, and different ethnic groups in California's noninstitutionalized population living in households. The survey and data collection are conducted by the University of California, Los Angeles, Center for Health Policy Research in conjunction with the California Department of Health Services and the Public Health Institute (Brown, Holtby, Zahnd, & Abbott, 2005, p.333). The CHIS 2005 is a large population-based, cross-sectional, biennial health survey in California that is the largest state survey in the United States. A detailed description of the CHIS methodology has been published elsewhere (CHIS, 2007a).

Sampling Design

The objective of the CHIS sampling design is to provide health-related estimates for the overall population in California, the largest ethnic/racial groups, and several smaller ethnic/racial groups of interest. Information collected in the CHIS 2005 included the occurrence of healthy and unhealthy behaviors, exposure to potential risk factors, dietary intake, physiological measures (height, weight), health care services and utilization, the incidence and prevalence of disease, and other health-related factors. Data are input directly into a computer during the interview process. The sample purposefully represents the ethnic diversity of California to increase generalizability. The data were collected for this survey between July 2005 and April 2006.

The sample design for CHIS 2005 was complex, requiring weighting to make accurate population estimates.The CHIS sample was designed to yield estimates for most counties in California and for the state's major ethnic and racial groups as well as for numerous smaller racial and ethnic populations. Certain ethnic groups (Korean and Vietnamese) were purposefully oversampled by using telephone numbers associated with group-specific surnames drawn from listed telephone directories to increase the sample size further (CHIS, 2007b). The survey's large sample size and administration in 5 languages, including English, Spanish, Chinese (Mandarin and Cantonese dialects), Korean, and Vietnamese, helps to capture the rich diversity of the California population. These languages were chosen on the basis of analysis of data from the 2000 census to identify the languages that would cover the largest number of Californians, thus improving the chances of the CHIS representing California's diverse population (CHIS, 2007a; Ponce, Lavarreda, Yen, Brown, DiSogra, & Satter, 2004). Approximately 10% of

the adult interviews, 18% of the child (parent proxy) interviews, and 7% of all adolescent interviews were completed in a language other than English (CHIS, 2007b).

Data Collection

Survey data were collected by using a multistage random digit-dial telephone survey, with 41 geographically defined sampling strata, a large sample, and purposeful oversampling of several ethnic populations. In those households with adolescents (12-17 years old) and/or children (<12 years old), 1 adolescent and 1 child were randomly selected; the adolescents were interviewed directly after consent for participation was obtained from the parent, and the adult most knowledgeable about the child's health completed the child interview (CHIS, 2007a). Data were collected on 43,020 adults and 4,029 adolescents. Detailed descriptions of the sampling and data collection methods can be found in the CHIS 2005 Methodology Series, posted on the web at http://www.chis.ucla.edu.

Response Rates

The overall response rate for CHIS 2005 was created by combining the screener completion rate (successful introduction of survey to a household and randomly selecting an adult to be interviewed) and the extended interview completion rate (successfully getting one or more selected persons to complete the extended interview) (CHIS, 2007a). For CHIS 2005, letters explaining the survey in 5 languages were sent out in advance to 67% of the sampled telephone numbers to maximize response rates (CHIS, 2007a). The household extended interview response rate was 59.3%, which is comparable to other random-digit-dial surveys. Overall extended interview response rates were 48.5% for adolescents and 75.2% for children (CHIS, 2007).

Study Variables

Demographic

The purpose of the study was to explore the ethnic and gender differences in factors contributing to overweight in adolescents participating in the CHIS. Based on the ecological model, questions related to gender, age, parents' educational level, household income, physical activity, sedentary activity, breakfast consumption, and family meals were selected for analysis.

Adolescents, 12 to 17 years old, self-reported their age, gender, and race/ethnicity. The variable for age was categorized to include groupings as follows: 12 to 13 years old, 14 to 15 years old, and 16 to 17 years old. Inclusion in this analysis was based on self-report of specific ethnicities including Latino, Asian American, and white; all other self-reported ethnic groups were excluded from analysis. Socioeconomic status was explored by using the percentage of federal poverty level (FPL) with ranges of 0% FPL to 99% FPL (lowest income group), 100% FPL to 199% FPL, 200% FPL to 299% FPL, and greater than 300% FPL (highest income group).

Parents' Educational Level

Parents' educational level was based on the question "What is the highest grade of education you have completed and received credit for?" This information was reported by parents before or immediately after the adolescent was interviewed. This variable originally had 11 categories (no formal education, grade 1-8, grade 9-11, grade 12/high school diploma, some college, vocational school, associate's degree, bachelor's degree, some graduate school, master's degree, doctorate or equivalent). Parents' educational

level was recoded into 4 categories: less than high school, high school graduate, some college, and college degree or higher.

Outcome/BMI and Overweight Status

Adolescents self-reported their height and weight, and then BMI was calculated (BMI = weight in kilograms divided by height in meters squared). This variable was created by taking the self-reported height and weight for each participant and then using the BMI to determine age- and gender-specific percentiles for the BMI. BMI between the 5th and the 84th percentile were considered to be "normal weight" and BMIs at the 85th percentile and higher were considered "overweight" according to the CDC's criteria from 2000 (CDC, 2009a).

Physical Activity

Adolescents were asked questions related to physical activity including "Over a typical week, on how many days are you physically active for at least 60 minutes total per day?" The physical activity variable was recoded depending on whether the adolescent met the American Pediatric Association's (APA's) guidelines for physical activity, which is a minimum of 60 minutes of moderate physical activity for at least 3 days per week. The continuous variable was recoded to a dichotomous variable yes (≥3 days of physical activity for 60 min/day) or no (<3 days of physical activity for 60 min/day).

Sedentary Activity

For sedentary activity, adolescents were asked to "think about your free time on Monday through Friday, on a typical day, about how many hours do you usually watch TV or play video games?" and "about how many hours per day on Monday through

Friday do you use a computer for fun, not schoolwork?" These same questions related to sedentary activity were asked about a typical Saturday and Sunday. First television/video time and computer time were added together for the Monday through Friday time period and the same was calculated for the Saturday through Sunday period. The average daily number of hours spent on these sedentary activities was calculated as a weighted average of weekday and weekend responses. A new variable called screen time was created that summarized sedentary activity in each adolescent, dichotomizing this number into meeting the APA's guideline for sedentary activity or not meeting the APA's guidelines (APA recommends no more than 2 hours of screen time per day). The screen time variable allowed easy comparison with the physical activity guidelines.

Breakfast Consumption

Another question posed that related to health-promoting behaviors involved breakfast consumption. Adolescents were asked, "In the past 7 days, how many days did you eat breakfast?" The number of days that breakfast was eaten was dichotomized to create a yes or no response to whether breakfast was eaten in the morning. Responses of 0 to 6 days were dichotomized as no and 7 days was dichotomized as yes.

Family Meals

Adolescents were asked, "In the past 7 days, how many days did you eat dinner at home with at least one of your parents (guardians)?" The variable related to eating dinner at home with at least one parent or guardian was also dichotomized as no for 0 to 6 days and yes for 7 days.

Statistical Analysis

In order to represent the study population eighty replicate weights and a final weight variable were used to generate descriptive statistics for all of the study variables, means and standard deviations for the continuous variables, and frequency and percentages for categorical variables.

Univariate logistic regressions were used for each of the independent variables (gender, ethnicity, physical activity, sedentary activity, breakfast consumption, family meals, age, parents' educational level, and household income) to predict the dichotomous overweight outcome variable (overweight vs not overweight). The relationships between these independent variables and overweight status were also examined through the alternative strategy of contingency tables and the chi-square statistic. A multivariate logistic regression was then performed to examine the interrelationships between all of the independent variables simultaneously and overweight status. Potential interactions between gender or ethnicity and the other independent variables were also explored in the multiple logistic regression analysis. All analyses were performed by using SPSS/PC statistical program (version 10 for Windows; STATA, College Station, Texas). A *p* value of .05 or less was accepted as significant.

Results

General Characteristics

A total of 3315 California adolescents from 12 to 17 years old were included in the analysis. Tables 1 and 2 present information about the characteristics of white (51.4%), Latino (35.0%), and Asian American (13.6%) adolescents participating in the 2005 CHIS. Overall parents of adolescents in the 2005 CHIS study had high levels of

education attainment (56.7% with some college or a college degree and higher). Only 16.2% reported incomes at or below the poverty level, and almost half reported incomes at or above 300% of the poverty level.

Less than 20% of the respondents met the APA's recommendation of 2 hours or less of screen time per day (combination of TV, computer, video games). Asian American adolescents had the highest percentage of respondents exceeding 2 hours (87% for girls and 91% for boys). Only 26% of respondents did not meet the APA's recommendations for physical activity (60 minutes of moderate physical activity > 3 days/week). Again, Asian American adolescents had the highest percentage of respondents not meeting the APA's recommendation for physical activity (43% for girls and 37% for boys). The mean number of days that respondents were physically active for a minimum of 60 minutes per day was 3.90 (SE, 0.05). Mean screen time for respondents was 3.82 hours per day (SE, 0.07). More than 50% of respondents reported not eating breakfast on a daily basis, particularly white girls and Latinas. Forty-five percent of respondents reported not eating dinner with a parent or guardian daily, and this pattern was seen more often in white and Latino girls and boys. Table 3 summarizes the prevalence of the independent variables described here on the basis of gender and ethnicity.

Prevalence of Overweight by Sex and Ethnicity

Approximately 34% of adolescent boys in California had BMIs greater than the 85th percentile for age and gender, compared with 22% of girls ($\chi^2 = 62.29$, $p < .001$; Table 4). Latino adolescents (37.5%) were more likely to be overweight than whites (25%) or Asian Americans (16%) ($\chi^2 = 91.5661$, $p < .001$). A higher percentage of

adolescents between the ages of 12 and 13 (32%) were overweight than ages 14 and 15 (26%) or 16 and 17 (27%; $\chi^2 = 10.10$, $p = .05$). Approximately 29% of adolescents who did not meet the APA's standard for physical activity were overweight, but 28% of adolescents who reported meeting the APA's standard also were overweight. Similarly, adolescents who did not meet the recommendation for sedentary activity (29%) were more likely to be overweight than were adolescents who met this standard (25.3%) ($\chi^2 = 3.02$, $p = .27$).

Adolescents who did not eat breakfast daily were more likely to be overweight than were adolescents who ate breakfast every morning ($\chi^2 = 16.26$, $p < .005$). Parents' educational level also was related to overweight status in adolescents. The less education that a parent had attained, the more likely the adolescent was overweight; 38% of adolescents with parents with a high school education were overweight, whereas only 20% of adolescents with parents who had a college degree or higher were reported as overweight ($\chi^2 = .90.03$, $p < .001$). Family income level was also significant; income at the poverty level was more likely to be associated with overweight, compared with adolescents with family income of 300% of FPL or greater ($\chi^2 = 48.80$, $p < .001$; Table 4).

Factors Associated with Overweight

Multiple logistic regression was performed to assess the effect of a number of factors on the likelihood that respondents would report that they were overweight. The model contained 12 independent variables (sex, race [2 comparisons], meeting recommendation for physical activity, meeting recommendation for sedentary activity, age [2 comparisons], parents' educational level, and poverty level [3 comparisons], daily

meal with parent or guardian, and breakfast consumption). The full model containing all predictors was statistically significant ($F_{9,70} = 13.08$, $p < .001$), indicating that the model could distinguish between respondents who reported and did not report being overweight. The model as a whole explained between 6.4% (Cox and Snell R^2) and 9.4% (Nagelkerke R^2) of the variance in overweight status and correctly classified 74.4% of cases.

Only 4 of the independent variables (sex, age, parents' educational level, and breakfast consumption) made a unique statistically significant contribution to the model (Table 5A). The strongest predictor of an adolescent reporting himself or herself as overweight was gender, with an odds ratio of 2.03. Thus male adolescents were almost twice as likely as female adolescents to report being overweight, once all other factors in the model were controlled for. The odds ratio of 0.76 for parents' educational level was less than 1, indicating that as adult education level increased it was 0.76 times less likely that the adolescent would report being overweight, once the other factors in the model were controlled for.

Multivariate Logistic Regression by Ethnicity and Gender

A multiple logistic regression model (Table 5B) was formulated, with gender and ethnicity controlled for, to examine factors contributing to overweight. White girls were 2.73 times (p =.008) more likely to be overweight if they had a low socioeconomic status (100%-199% FPL compared with >300% FPL). Latina girls were 7 times more likely to be overweight if their parents had less than a high school education (p = .006). Asian American girls were 2.97 times less likely to be overweight as their parents' educational level increased (p = .01). Two factors contributed to overweight in white boys: higher screen time (p = .001), and lower parents' educational level (p =.004). Latino boys also

were 2.6 times more likely to be overweight if their parents had only a high school education. Asian American boys had no factors in the model that were associated with an increased risk of overweight. The differences found among ethnicities and genders seem unique except for parents' educational level, which contributed to overweight in Latino boys and girls as well as Asian American girls and white boys.

Univariate Logistic Regression

According to univariate logistic regression (Table 6), boys were 1.86 times as likely as girls to be overweight ($p < .001$). Latinos were more likely to be overweight than whites (1.81, $p < .001$), whereas Asian Americans were less likely to be overweight than whites (0.58, $p < .001$). Neither meeting the recommendation for physical activity set forth by the APA or meeting the screen time recommendations were a statistically significant contributors to adolescents' being overweight (Table 6). Daily breakfast consumption had an odds ratio of 0.73, indicating that the likelihood of being overweight decreased as the frequency of eating breakfast increased ($p = .006$). When the 3 age groups (12-13, 14-15, and 16-17 years old) were compared, with the 16 to 17 year olds used as the reference group, no significant differences were noted. When the percentage of FPL (0-99, 100-199, 200-299, >300) were compared, with >300% FPL used as the reference group, adolescents in the lower income groups (0%-99% FPL and 100%-199% FPL) were 1.89 times and 1.69 times, respectively, more likely to be overweight than were adolescents in the >300% FPL group ($p <.001$).

Discussion

Although factors related to obesity in adolescents have been examined in several studies, this study is one of the first in which ethnic and gender differences in obesity in

California were explored. Our findings indicated ethnic and gender differences in overweight in California adolescents. Adolescent obesity is a multifactorial condition influenced by both modifiable and nonmodifiable factors (Perry, Rosenblatt, & Wang, 2004). The ecological systems theory emphasizes the importance of considering the individual as well as the context within which the adolescent is embedded. Behavioral choices are not made in a vacuum or without the broader social environment including the family, community and broader society being considered. Our study showed Latino boys (41%) were more likely than any other group to be overweight followed by Latina girls (34%), white boys (31.2%), Asian American boys (27%), white girls (18%), and Asian American girls (4%). National statistics (National Health and Nutrition Examination Survey, 2003-2004) indicate that the prevalence of overweight was 22.8% (male) and 10.4% (female). Asian American adolescents compared with 26.5% (male) and 22.2% (female) in white adolescents, whereas Latinos had the highest rates of overweight with 37.3% (male) and 31.1% (female) (Gordon-Larsen, Adair, & Popkin, 2003). Although Asian Americans have the lowest prevalence of overweight, studies have indicated different cutoff points for Asian Americans because of their higher risk of cardiovascular disease at low BMIs (Freedman, Wang, Thornton, Mei, Pierson, & Dietz, 2008).

The prevalence of being at risk for overweight and being overweight are higher among 6 to 11 year olds than among 12 to 19 year olds (Ogden, Carroll, Curtin, McDowell, Tabak, Flegal, et al. 2006). This finding was confirmed by the results of our study, with 32% of children in the 12- to 13-year-old group being overweight compared with 26% of the 14- to 15-year-old group (p = .05). Similar to 14 and 15 year olds, 27%

of 16 and 17 year olds were overweight. Therefore, overweight prevention should start in early childhood.

Our study results indicate that white girls were at greater risk of being overweight if they had a lower household income. Published reports indicate that socioeconomic status is a factor that contributes to overweight status, especially in U.S. whites, but also to a lesser degree in minorities (Gordon-Larsen, Adair, & Popkin, 2003; Scharoun-Lee, Adair, Kaufman, & Gordon, Larsen, 2009; Zhang, & Wang, 2004). The literature also suggests that socioeconomic status has a different effect on overweight in white (high socioeconomic status = low BMI in whites) compared with African American (high socioeconomic status = high BMI). Our results support the published results in that white girls were the only group in which low socioeconomic status (%FPL < 199) made a statistically significant contribution to overweight. Environmental factors associated with low socioeconomic status, including increased access to fast food and convenience stores rather than access to grocery stores, may contribute. Unsafe neighborhoods or limited exercise facilities may also contribute to our finding. However, the reason socioeconomic status affects the risk of being overweight only in white girls remains unclear. Researchers should examine the potential mechanisms by which socioeconomic status affects risk of overweight in white girls.

Several of our groups had a higher risk of being overweight if their parents had low educational levels. Parent educational level has also been associated with overweight status in children (Chen, 2008; Parizkova, 2008). For both Latino boys and girls as well as Asian American girls and white boys, this relationship was found to hold true, but it was not a factor in the other ethnic/gender groups. Future research should look into the

variations and possible explanations for the influence of parents' educational level on overweight risk among various ethnicities and different genders. Breakfast was not a significant factor for any ethnic/gender group, which was an unexpected finding. Less desirable meal patterns such as skipping meals have also been reported to contribute to increased risk of being overweight (Berkey, Rockett, Gillman, Field, & Colditz, 2003). According to Sinha (2008), the habit of skipping breakfast and overeating dinner increases the risk of overweight. In our study, breakfast consumption was associated with increased risk of overweight in some gender/ethnic groups and was a statistically significant factor for all adolescents in general. In several cross-sectional studies, mainly in white girls, researchers have found an inverse relationship between eating breakfast and BMI (Timlin, Pereira, Story, & Neumark-Sztainer, 2008). Boutelle et al.(2002) report an ethnically diverse sample but analyze data only by gender. Limited research exists related to difference in breakfast consumption and the effect on BMI in an ethnically diverse sample (Pearson, Biddle, & Gorely, 2009). It is unclear why not eating breakfast was not a risk factor based on gender and ethnicity, but as rates of breakfast consumption decrease throughout adolescence and into adulthood, the impact of regular breakfast consumption may be an important variable to consider. This area of ethnic differences and skipped meals has not been researched, and further research should explore ethnic and gender differences in breakfast consumption and the relationship to overweight status. For white boys, screen time contributed to the overweight status along with the parents' educational level.

In our study, frequency of family meals was not a significant contributor to overweight in Latino, Asian American, or white California adolescents. Frequency of

meals may not be a factor because of the older age of the sample (early and late adolescents rather than preschool and school-age children) and their increasing independence and autonomy around food choices and meal times. The literature related to frequency of family meals and weight status is controversial. Fulkerson et al. (2007) report middle school girls have a significant risk of being overweight if they do not eat regular family meals. Gable et al. (2007) assessed family meal frequency in school-age children and found a significant inverse association between frequency of family meals and overweight status. The significance of the frequency of family meals seems to vary with gender (Neumark-Sztainer, Wall, Haines, Story, Sherwood, & van den Berg, 2007), highlighting the need for additional research in this area.

Asian American boys had no specific factors that contributed significantly to overweight status. It is unclear why sedentary activity, which was highest in Asian American boys (91% had > 2 hours/day), was not a significant contributor to overweight status in this group. Asian American boys and girls were also the groups that were least likely to achieve 3 hours per week of physical activity. In contrast, 2 behaviors that have been linked to more healthy weight status were more prevalent in Asian American girls: eating breakfast and sharing family meals on a daily basis. Possibly regular meals shared with the family improved this group's nutritional status, which is known to be protective.

Several factors contributed to overweight status in white boys, including screen time and educational level of their parents. As indicated by the principle of thermodynamics (energy in must equal energy out), physical activity, sedentary activity, and nutritional factors also play an important role in weight status (Lustig, 2006; CDC, 2009b). Interestingly, screen time (sedentary activity) contributed to overweight status

only in white boys, who spent an average of 3.92 hours/day (compared with national averages of 4.6 hours/day viewing) television or playing on the computer or with video games. Despite Asian American boys averaging 4.94 hours of sedentary activity, more than twice the APA's recommendation of less than 2 hours daily, and being physically active for 60 minutes or more for only 3.53 days, minimally meeting the APA's recommendation of 60 minutes of moderate physical activity 3 or more days per week, neither of these factors contributed significantly to overweight in this group. Several studies have indicated that the prevalence of adequate physical activity is particularly low among Hispanics, as well as African American and Asian American adolescents (Eaton, Kann, Kinchen, Ross, Hawkins, Harris, et al., 2006; Gordon-Larsen, McMurray, & Popkin, 1999). Despite this obvious ethnic disparity, few published reports describe studies specific to physical activity in Hispanic American and Asian American adolescents (ADA, 2006).

The different factors that contribute to overweight status may be due to our oversampling of the Asian American subgroups and to the diverse population of California. This study is unique in looking at sub-groups in California adolescents which has not been done in the research to date. These findings are significant because when developing interventions for adolescents, we need to consider the possible variation in factors that contribute to overweight status based on their gender and ethnicity.

Strengths, Limitations, and Recommendations

The strength of this study is the large sample size, which allowed analysis of multiple variables that, could contribute to overweight in the ethnically diverse adolescents in California. Limitations of this study included self-reporting and the

potential recall bias. Further research that uses objective measures of physical activity and body composition must be done in the area of gender and ethnic disparities as they relate to overweight. A better understanding of the differences that exist in the factors contributing to overweight in adolescents is necessary before we can develop interventions to address this growing public health issue.

Conclusions

The main finding in this study was that gender and ethnic variations are apparent in factors that contribute to overweight in California adolescents. A higher percentage of Latino adolescents, especially boys, are overweight while a large proportion of Asian adolescents participate in excessive sedentary activity and limited physical activity.

A better understanding of the differences among these various sub-groups is important for the development of interventions. Disease states seen in children related to overweight status include precursors of type 2 diabetes, cardiovascular disease, sleep disorders, and metabolic syndrome (Daniels, 2006). Current research continues to explore the strong correlation between genetic predisposition and variations in metabolic function in certain ethnic groups. According to Wang and Beydoun (2007), diabetes will develop at some point in half of the Latinos born today as a result of obesity.

Multiple and varying factors contribute to overweight in the ethnically diverse adolescent population of California. Published reports suggest that interventions to help address the issue of overweight in adolescents may need to be specific to gender and or ethnicity, and our findings support that approach. To reduce the current obesity epidemic among adolescents, clinicians and researchers must develop culturally sensitive and gender-specific interventions that address the unique needs of an ethnically diverse

adolescent population. More research also must be done to determine the factors related to increased BMI over time in adolescents and their relationship with gender and ethnicity.

CHAPTER FIVE

RISK FACTORS FOR DECREASED PHYSICAL ACTIVITY IN WHITE, LATINO, AND ASIAN CALIFORNIA ADOLESCENTS

To Be Submitted to Pediatric Exercise Science

Abstract

The aim of this study was to examine factors related to decreased physical activity in White, Latino, and Asian adolescents (age 12-17) in California by using data from the California Health Interview Survey for 2005. A total of 3,006 adolescents were included in the analysis. Risk factors related to decreased physical activity varied by gender and ethnicity; increased screen time and fair general health status were common risk factors in the sample. Culturally sensitive interventions that address the unique needs of an ethnically diverse adolescent population must be developed.

Keywords: Adolescent, physical activity, general health status, sedentary activity

Risk Factors for Decreased Physical Activity in White, Latino, and Asian California Adolescents

Introduction

Regular physical activity and decreased sedentary activity have been associated with many health benefits, including prevention of heart disease (Groner, Joshi, & Bauer, 2006; Meyer, Kundt, Lenschow, Schuff-Werner, & Kienast, 2006), diabetes (Li, Bowerman, & Heber, 2005), hypertension (American Heart Association, 2007; Kelley, Kelley, & Tran, 2003), and osteoporosis (Wearing, Henning, Byrne, Steele, & Hills, 2006). Increased physical activity also improves mental health (Beets, Pitetti, & Forlaw, 2007; Bonhauser et al., 2005; Carvajal, Hanson, Romero, & Coyle, 2002). Healthy People 2010 emphasizes the importance of regular participation in moderate physical activity as an essential component of a lifestyle that promotes health (U.S. Department of Health and Human Services, 2000) and has identified physical activity as a leading health indicator. However, currently many children and adolescents in the U.S. are not active; only 38% of adolescent females and 24% of adolescent males met the national recommendation for moderate or vigorous physical activity (U.S. Department of Health and Human Services, 1996, 2000).

The amount of physical activity in adolescents varies across gender, ethnicity, and income status. Adequate physical activity is particularly low among Hispanic, African American, and Asian-American adolescents (Centers for Disease Control and Prevention, 2006; Gordon-Larsen, McMurray, & Popkin, 1999). A dramatic decline in physical activity occurs during adolescence, especially in adolescent females, older adolescents,

minorities, and disadvantaged youth (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003; Patrick et al., 2004). In addition, high school girls in all racial/ethnic groups are less active than high school boys are (Grunbaum et al., 2002).

Several factors are related to decreased physical activity in adolescents: low socioeconomic status, poor/fair general health status, screen time (computer, television, video games), lack of parental support, and parents who are inactive. The environment is an important influence on physical activity in adolescents, especially in regard to access to opportunities for physical activity. Youth of low socioeconomic status participate in less physical activity than do adolescents of higher socioeconomic status (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999; Lowry, Kann, Collins, & Kolbe, 1996; Woodfield, Duncan, Al-Nakeeb, Nevill, & Jenkins, 2002). Socioeconomic status may affect the environment that adolescents can access for physical activity.

Poor/fair general health status also affects physical activity in adolescents. Alricsson, Landstad, Romild, and Werner (2006) found a positive correlation (0.22; $p < .001$) between poor self-related health and a lower level of physical activity in 16- to 19-year-old high school students. Similarly, in a study with 1,090 high school students, physically active students reported better self-related health than less physically active students reported (Reichard, Alricsson, & Werner, 2008). Screen time in association with physical activity has also been described. A study of more than 25,000 9th through 12th graders showed that adolescent males who had more than 2 hours of screen time per day were 1.35 times more likely than boys or girls who had less than 2 hours of screen time per day to have low activity levels (Leatherdale & Wong, 2009). However, Marshall, Gorely, and Biddle (2006) found no association between television viewing and physical

activity among children or adolescents, a finding supported by Sallis and Saelens (2000). The inconsistencies in the literature might be related to the use of differing criteria to describe sedentary activity.

Parents critically influence children's health behaviors, including physical activity during childhood and adolescence (Davidson, Cutting, & Birch, 2003; Ornelas, Perreira, & Ayala, 2007). Parents can influence their children's physical activity both directly and indirectly. In a qualitative study, parental influence, including parental support (words of encouragement) and active role modeling, facilitated physical activity in children and adolescents, according to the children (Wright, Wilson, Griffin, & Evans, 2008). However, in a longitudinal study of the relationship between parents' physical activity and the physical activity of teens, Anderssen, Wold, and Torsheim (2006) found only a weak to nonexistent association between changes in parents' physical activity and changes in adolescents' physical activity over time, suggesting that parental physical activity might not transmit to their children to the degree that is often assumed. The inconsistencies in the published findings might be related to the differing means of gathering data and the differing characteristics of the samples in the different studies.

Few studies have addressed the general health, amount of sedentary activity, weight status, and socioeconomic status of adolescents; the impact that parental physical activity, education attainment, acculturation level, and body mass index (BMI) may have on an adolescent's level of physical activity; and variations in risk factors by gender and ethnicity. The aim of this study was to examine factors related to physical inactivity in White, Latino, and Asian adolescents (age 12-17) living in California.

Methods

Survey Design and Sample

Implementation of the California Health Interview Survey (CHIS) provided data to determine prevalence of and trends in health-related behaviors among adults, adolescents, and children in California. In the present study, we analyzed data from the CHIS 2005, which is a biennial population-based comprehensive health survey of California. It is the largest random-digit-dial telephone survey of more than 45,000 households drawn from every county in California. The sample represents the state's noninstitutionalized population living in households. The study included children 12 to 17 years old and their families. From each household, one adult and one adolescent, if present, were interviewed for the CHIS.

Inclusion criteria for this study include having a parent or guardian participating in the study, being between 12 and 17 years old, and self-reporting ethnicity as White, Latino, or Asian American. The interviews were conducted in English, Spanish, Chinese (Mandarin and Cantonese dialects), Korean, and Vietnamese to capture the rich diversity of the California population. The sample is designed to provide population-based estimates for most California counties. In order to produce unbiased and consistent estimates of variance based on data from the CHIS, a weighting variable is included in the analysis.

Data from both the adult and adolescent surveys were used for this analysis in order to describe associations between parents'/guardians' health behaviors and adolescents' health behaviors. Confidential data files made available through the Data Access Center at the University of California, Los Angeles, were used for this purpose.

Before the Data Access Center was approached, a nondisclosure affidavit was submitted in conjunction with proof of exemption of the research project by the University of California, San Francisco, Committee on Human Research and approved by the CHIS Data Disclosure Review Committee. A full description of the methods is available from the Center for Health Policy Research of the University of California at Los Angeles (CHIS, 2007).

Variables for Adolescents

Socioeconomic and demographic characteristics. Adolescents, 12 to 17 years old, provided the following self-reported information: age, gender, and ethnicity. This study involves only self-identified White, Latino, and Asian adolescents. Parents provided information related to household income (which was converted to the percentage of the federal poverty level [FPL]).

Physical activity. The adolescents were asked how many days in the last week they had been physically active for at least 60 minutes total per day (recommendation of the American Academy of Pediatrics). This variable was recoded into a dichotomous variable: less than 3 days of recommended physical activity per week or 3 days or more of recommended physical activity per week. For the purpose of this article, we will refer to less than 3 days of recommended physical activity per week as *inactive* and 3 days or more of recommended physical activity per week as *active*.

Sedentary activity. Adolescents were asked how many hours they usually watch television or play video games in their free time on a typical day from Monday through Friday. The same question was asked about computer time. Adolescents were also asked these same questions about weekends. A new variable was calculated to determine the

mean screen time (combination of television, video games, and computer) per day. This continuous variable was recoded into a dichotomous variable: less than 2 hours of screen time per day or greater than 2 hours of screen time per day (based on the guidelines from the American Academy of Pediatrics).

General health status. Adolescents were asked to assess their general health status by responding to the question "In general, would you say your health is excellent, very good, good, fair, or poor?" This measure was evaluated on a scale of 1 to 5, with 5 representing excellent.

Variables for Adults

Parental physical activity. Adults were asked the number of minutes they spent participating in moderate physical activity and in vigorous physical activity in their free time on an average day. A variable was created by using these 2 forms of exercise to obtain a weekly average for the combination of moderate and vigorous physical activity. From this continuous variable, a dichotomous variable was created: less than 150 minutes per week = *nonadherent*, more than 150 minutes per week = *adherent*.

Parental education level. Parent education attainment was coded as less than high school, high school or diploma, some college, or college degree or higher.

Parental acculturation. Years living in the United States was the variable used to determine level of acculturation. Less than 5 years was considered *low acculturation* and 5 years or more was considered *acculturated*.

Parental BMI. The BMI was calculated from self-reported weight in kilograms divided by the square of height in meters. A BMI of 30 or greater is considered obese (National Heart, Lung, and Blood Institute, 1998).

Statistical Analysis

SPSS Complex Samples for Windows (version 16) was used to manage survey data and generate the statistics for this study by using 80 replicate weights to produce population-based results. Descriptive statistics were generated for all variables in the study, means and standard deviations for the continuous variables and frequency and percentages for the categorical variables. Univariate logistic regressions were used for each of the independent variables (age, gender, ethnicity, socioeconomic status, general health status, sedentary activity, parents' physical activity, parents' BMI, parents' education attainment, number of years parent living in United States), to predict the dichotomous outcome variable for adolescent physical activity (<3 days/week [not meeting recommendation] vs. >3 days/week [meeting recommendation]). Alternative strategies of contingency tables and chi-square tests were used to explore the relationship between these independent variables and the physical activity outcome. A multivariate logistic regression was then performed to examine the interrelationships between all of the independent variables and physical activity status simultaneously. The logistic regression model including all independent variables was also run with gender and ethnicity controlled for to account for differences among these subgroups. A p less than .05 was considered significant.

Results

A total of 3,006 California White, Latino, and Asian adolescents from 12 to 17 years old were included in the analysis. Table 7 presents information about the characteristics of the White (67%), Latino (23%), and Asian American (11%) adolescents

and parents who participated in the 2005 CHIS. Although this sample represented an ethnically diverse population, overall the group was found to be well acculturated: 89% had lived in the United States for 15 years or more. Of the parents in this sample, almost 60% were overweight (BMI ≥ 25) and 21% were obese (BMI ≥ 30). Approximately half as many adolescents as their parents were considered overweight (30% ≥ 85th percentile). Only 9% of parents reported doing 150 minutes or more of physical activity per week, whereas 74% of adolescents reported doing 60 minutes or more of physical activity for at least 3 days per week. Approximately 52% of parents had some college or a college degree, compared with 24% of parents with less than a high school diploma. Fifty-two percent of these households had incomes that met or exceeded 300% of the FPL. In the sample, Latino and Asian parents were less likely than White parents to be physically active, and a similar trend was observed in the teens. Latino parents were more likely than White or Asian parents to be overweight or obese, which was also the case in the teens. Latinos were more likely than Whites or Asians to fall at or below the 199% FPL. Latino parents were more likely than the other groups to have a lower educational level (Table 7).

As for differences in physical activity level, girls were less active than boys, with 78% of boys reporting participating in regular physical activity (60 minutes > 3 days per week) compared with only 70% of girls ($\chi^2 = 21.95$, $p = .002$). Latinos (71%) and Asians (64%) were less likely than White teens to achieve the recommended amount of physical activity (79%) ($\chi^2 = 41.60$, $p < .001$). Adolescents who had 2 hours or more of screen time per day reported being less physically activity (72%) than adolescents who had less than 2 hours of screen time per day reported (81%). Adolescents reporting fair general

health status were significantly less likely to meet the physical activity recommendation than were adolescents reporting very good or excellent health ($\chi^2 = 67.54$, $p < .001$). Older adolescents (16-17 years old) reported less physical activity (66%) than younger adolescents reported (78% for 12-13 year olds, and 77% for 14-15 year olds). Adolescents with parents who have a high school education or higher were more physically active than teens of parents with less than a high school education ($\chi^2 = 55.86$, $p < .001$; Table 8).

Factors Associated With Decreased Physical Activity

Univariate logistic regressions were used to explore factors associated with decreased physical activity. The household income, physical activity, educational level, years living in the United States, and BMI of adults were explored in relation to teens' physical activity. Adolescents with low socioeconomic status (0-199% FPL) were twice as likely to be inactive as teens whose socioeconomic level was at 300% of the FPL or higher ($p < .001$). Adolescents with parents who have less than a high school education were twice as likely to be inactive as teens with parents with college degrees or higher ($p < .001$). Adolescents with parents living in the United States for 10 to 14 years were 1.8 times as likely to be inactive as adolescents whose parents had lived in the United States more than 15 years ($p < .001$).

Younger teens (12-15 years old) were almost two times less likely to be inactive as older teens (16-17 years old; $p < .001$) and females were 1.5 times more likely than males to be inactive ($p = .001$). Teens reporting fair general health status were 2.6 times more likely than teens reporting excellent general health to be inactive ($p < .001$). Asian

American teens were 2.4 times more likely than White teens to be inactive ($p = .004$; Table 9).

Logistic regression was performed to assess the impact of a number of factors on the likelihood that respondents would report inactivity. The model contained 10 independent variables (screen time, age, gender, ethnicity, household income, and general health status for teens and educational level, years living in the United States, physical activity, and BMI for adults). The full model containing all predictors was statistically significant ($F = 4.03$, $p < .001$), indicating the model was able to distinguish between respondents who reported and did not report inactivity. The model as a whole explained between 8% (Cox and Snell pseudo R^2) and 11.5% (Nagelkerke Pseudo R^2) of the variance in inactivity status. Six of the independent variables made a unique statistically significant contribution to the model (Table 10): screen time 2 hours/day or more (odds ratio [OR] = 1.71, $p < .05$), older age (OR = 1.8, $p < .05$), female gender (OR = 1.5, $p < .05$), Asian ethnicity (OR = 1.93, $p < .05$), household income 199% FPL or less (OR = 1.76, $p < .05$), and fair general health status (OR = 1.9, $p < .05$).

Factors Associated With Decreased Physical Activity by Gender and Race

Individual logistic regression models were performed with race and gender controlled for to determine if differences or similarities were apparent among these subgroups. All models were statistically significant at levels less than .05 (Table 11). White females were more likely to be inactive if they had more than 2 hours of screen time per day (OR = 2.25, $p = .002$), had a family income of 100% to 199% FPL (OR = 3.24, $p < .05$), reported fair health (OR = 3.8, $p < .05$), or had parents who are inactive (OR = 2.94, $p < .05$). Similarly, White males were more likely to be inactive if they were

of lower socioeconomic status (OR = 4.6, $p < .05$), reported fair general health status (OR = 3.8, $p < .05$), and were older (OR = 1.7, $p < .05$). In Latina females, risk factors for decreased physical activity included being older (OR = 3.9, $p < .05$), having parents who had lived in the United States for more than 15 years ($F = 90.00$, $p < .001$), and having parents with less than a high school education (OR = 3.0, $p < .05$). For Latino males, risk factors for inactivity include having obese parents ($F = 240.93$, $p < .001$), reporting more than 2 hours of screen time per day (OR = 3.2, $p < .05$), and having parents with less than a high school education (OR = 3.65, $p < .05$). Asian females had multiple factors that contributed to an increased risk of inactivity, including more than 2 hours of screen time/day (OR = 6.6, $p < .05$) reporting fair general health status (OR = 5.6, $p < .05$), having parents who have lived in United States for less than one year (OR = 2.343E10, $p < .05$), and having parents who are overweight (OR = 6.2, $p < .05$). Similar to Asian females, Asian males also had multiple factors that contribute to inactivity, including having parents who are obese (OR = 2.838E9, $p < .05$), low socioeconomic status ($F = 3.59$, $p = .016$), reported poor general health status (OR = 1.272E9, $p < .05$), older age (OR = 7.2, $p < .05$), parents with less than a high school education (OR = 4.6, $p < .05$), and having parents who have lived in the United States for only 1 year (OR = 2.890E9, $p <.05$). Similarities among gender and ethnic subgroups included having overweight and inactive parents, low socioeconomic status, and low levels of parental education. Similarly, younger adolescents regardless of subgroup were less likely to be inactive than their older counterparts. Excessive screen time and reporting fair general health status were also common risk factors identified by California adolescents.

Discussion

Physical activity has an important role in the increased health of an individual; however, a dramatic decrease in physical activity has been observed in adolescents. Although differences between genders are well documented, little has been published about differences between ethnicities. The purpose of this study was to examine factors related to decreased physical activity in White, Latino, and Asian adolescents (age 12-17) as well as the additive impact of various parental factors related to physical activity in adolescents. We found a significant difference in gender, with females more likely (30%) than males (22%) to be inactive. We also found ethnic differences: Latino (30%) and Asian (36%) teens were significantly less active than White teens (21.4%). According to the Youth Risk Behavior Survey (2003-2004), 28% of adolescent boys and 43% of adolescent girls currently do not meet the recommendation for 60 minutes of physical activity 3 or more days per week. The lower percentages in our study might be related to differences in the measure for physical activity, or a seasonal impact due to data collection at different times of the year.

The higher rates of inactivity in Asians might be explained by the increased amount of sedentary activity that they report, which is similar to the findings nationally (Centers for Disease Control and Prevention, 2002). Additionally, in the Asian American culture, the priority given to academic achievement may create a barrier to physical activity, as less time is available for physical activity (Neumark-Sztainer et al, 2003). In general, Asian American families placed more emphasis on academic achievement and related activities (computer, reading, college preparatory courses) than on physical activity (Caplan, Choy, & Whitmore, 1992; Chen & Stevenson, 1995). Parents of Asian

American youth feel that adolescence is a time to prepare for higher education, and for that reason physical activity may not be encouraged.

In our study, teens 16 to 17 years old were more likely to be inactive than were younger adolescents. Physical activity decreases with age, declining dramatically in the early teen years, typically at around 13 years old (Pate, Davis, Robinson, Stone, McKenzie, & Young, 2006). The decline is generally greater for males than females, and the decline varies by type and intensity of the activity. This steep decline from activity levels in young adolescence has been attributed to increased demands of high school education compared with middle school and also a decline in the enrollment in daily physical education classes (Allison, Dwyer, Goldenberg, Fein, Yoshida, & Boutilier, 2005, Centers for Disease Control and Prevention, 2006b). In addition, adolescents face various barriers to participation in physical activity, including lack of time, absence of social support (family, peers), body dissatisfaction, and lack of access to recreational facilities (Duncan, Duncan, Strycker, & Chaumeton, 2007; Hohepa, Schofield, & Kolt, 2006).

For the entire sample, we found an association between screen time and inactivity, indicating that teens who had more than 2 hours of screen time per day were more likely to be inactive ($p < .05$). This risk factor was unique for White females, Latino males, and Asian females. Although Asian males had the highest rates of sedentary activity, it is unclear why screen time was not a risk factor in this subgroup. According to the International Obesity Task Force (2007), the prevalence of inactivity is increasing among adolescents. Sedentary activity is a key factor associated with both physical activity and overweight status. An increase in sedentary behavior correlates with increasing age in

teens beginning as early as age 10 (Kimm et al., 2002). In a longitudinal study by Richards, Poulton, Reeder, and Williams (2009), television viewing was also a statistically significant predictor of physical inactivity. Although sedentary activity and physical activity are not mutually exclusive behaviors, because of the time constraints many adolescents face, decreasing sedentary activity and increasing physical activity seem to be clinically relevant suggestions. Leatherdale and Wong (2009) found that sedentary behavior may moderate the relationship between physical activity and being overweight, but this relationship is unclear, so further research is needed.

In our study, approximately 9% of adolescents reporting poor/fair general health reported no associated chronic illness (diabetes or asthma) and were found to be more likely to be inactive. In addition, 15% of adolescents reporting poor/fair general health status also reported having diabetes or asthma which may contribute to their increased odds of being inactive. General health status is a significant risk factor for decreased physical activity in all ethnic groups except Latinos. Results of longitudinal studies on physical activity indicate that lifestyle, social, and environmental factors may have an impact. Very good self-assessed health also promotes physical activity in adolescents (Dovey, Reeder, & Chalmers, 1998). Aarnio, Winter, Kujala, and Kaprio (2002) found that adolescents who reported poor general health were 3.7 times more likely than other adolescents to be inactive. Persistent inactivity was also associated with poorer reported general health and lower cardiorespiratory fitness (Richards et al., 2009).

Another risk factor for decreased physical activity is parental education level. More than 50% of the parents in this analysis had more than a high school education, and of those parents, more than 75% of their teens were active. The Latino parents in our study

were significantly less likely than both Asian-Americans and Whites to have completed high school, which might explain the higher rates of inactivity in both Latino parents and their children. In addition to the low education level of the Latinos in this sample, also the proportion of Latinos with a household income below the 199% FPL was higher than that among Asians and Whites. Both educational level and socioeconomic status are risk factors for decreased physical activity, which might explain why the Latino education level was significant. According to Sawchuk et al. (2008), higher educational level has a positive association with engagement in physical activity. Findings in the Behavioral Risk Surveillance System also indicate a clear association between lower education levels and inactive lifestyles (Harper & Lynch, 2007). We found low activity levels in Asians despite their high educational level because Asian Americans emphasize academic achievement over physical performance.

Acculturation was measured in Latinos and Asian Americans by using years lived in the United States. Our results showed that parents living in the United States for more than 15 years or born in the United States were more likely to be physically active. The parents in our study were highly acculturated; 94% were either born in the United States or had lived in the United States for more than 10 years. In our study, Latinas and Asian males and females whose parents had less acculturation were more likely to be inactive. Increased acculturation levels correlate with increased levels of physical activity. Everson, Sarmiento, and Ayala (2004) studied 20- to 50-year-old first-generation Latina immigrants to determine the association between acculturation and physical activity and reported that Latinas with higher acculturation were more likely to be physically active. Unger, Reynolds, Shakib, Spruijt-Metz, and Johnson (2004) explored the association

between level of acculturation and physical activity in first- and second-generation Latino and Asian adolescents and reported that more acculturated adolescents were more likely to be physically active. More acculturated adolescents may be aware of the benefits of physical activity and also may have more access and resources. Interventions to increase physical activity should target less acculturated or new immigrant adolescents and their families.

Differences and similarities were uncovered with respect to decreased physical activity. Increased screen time was a risk factor for White and Asian females as well as Latino males, and poor/fair reported general health status was a risk factor across White and Asian genders. Low acculturation levels for Asians and Latinos was predictive of decreased physical activity. Low levels of education were risk factors for all Latinos and for Asian males, and overweight status in parents was a risk factor for decreased physical activity in Latino males and Asian males and females.

The current study had several important strengths, including a large ethnically diverse sample of adolescents with linked parental information related to physical activity, BMI, acculturation, and educational level attained. Combining two data sets collected from different family members provided a snapshot into the family life of teens in California. One of the limitations of this study might be combining all Asians and Latinos into two subgroups, several variables for the Asian males and females had enormous odds ratios with corresponding standard errors, which were the result of the small sample size for these two subgroups, so interpretation is difficult. Combining many subgroups that are intended to represent multiple heterogeneous populations and examining these groups as a whole may have masked variations among ethnic groups. Another limitation of this

study was the way in which physical activity was measured, by self-report. Physical activity is a complex behavior and has many dimensions. The use of a questionnaire to measure physical activity rather than direct observation with accelerometers, pedometers or heart rate monitors may also be a limitation.

In summary, our results reveal several similarities among adolescents of multiple ethnic backgrounds and indicate that specific interventions must be developed to target common risk factors for decreased physical activity in high-risk groups, which include Latino and Asian adolescents. It is important to consider modifiable risk factors, and we know from our study that increased screen time and perception of poor general health are areas on which research should be focused. The development of culturally appropriate and gender-specific interventions that promote general health status and decreased screen time is critical for increasing physical activity in adolescents.

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CHAPTER SIX

BODY DISSATISFACTION IN CALIFORNIA ADOLESCENTS

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Abstract

Factors that contribute to body dissatisfaction among adolescents from ethnically diverse California were examined to determine if the factors vary with gender and race. Data from the 2005 California Health Interview Survey were used; 1807 White, Latino, and Asian American adolescents from 12 to 17 years old were included. Ordinal multiple logistic regression with gender and ethnicity controlled for was used to determine factors (high body mass index and poor/fair general health status) that contribute to body dissatisfaction across gender and ethnicity in California adolescents. Other factors related to body dissatisfaction varied with ethnicity and gender. Gender- and ethnicity-specific interventions to improve body image in adolescents must be developed.

Keywords: body dissatisfaction; adolescent; ethnicity; gender; risk factors

Body Dissatisfaction in California Adolescents

Introduction

Body image is a multifaceted construct made up of cognitive, affective, and behavioral components that are well documented in the literature (Duncan, Al-Nakeeb, Nevill, & Jones, 2006). Within this framework, "body dissatisfaction is defined as the affective component of body image, or how an individual feels about his/her body" (Duncan et al., p. 89). The prevalence of body dissatisfaction affects individuals across the life span, so understanding factors related to body dissatisfaction, especially in adolescence, is important. Adolescence is a time of life when many changes occur both psychosocially and physically, and these changes are influenced by many intrinsic (self-efficacy, genetic predisposition) and extrinsic (peers, family, society) factors. In the teen years, body satisfaction plays a significant role at a personal level as well as within the family, among friends, with peers at school, and globally with societal expectations.

Brumberg (1997) reports that at age 13, 53% of American girls are "unhappy" with their bodies. This percentage increases to 78% by the time girls reach 17 years old. Research indicates that many boys are also dissatisfied with their bodies and suffer negative psychological and health sequelae (Cafri, Thompson, Ricciardelli, McCabe, Smolak, & Yesalis, 2005; Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Presnell, Bearman, & Stice, 2004). Data from the 2007 Youth Risk Behavior Survey indicate that 34.5% of adolescent girls and 24.2% of boys were dissatisfied with their bodies, and 60.3% of girls and 30.4% of boys were trying to lose weight. Thus weight-loss behaviors occur in the absence of reported body dissatisfaction (Centers for Disease Control and Prevention [CDC], 2008). Differences in body dissatisfaction between ethnic

groups have been reported. Latinos tend to be the least satisfied with their body (33.8%), followed by whites (28.8%) and African Americans (24.6%) (CDC, 2008). According to Yates, Edman, and Aruguette (2004), Asian American teens tend to be less satisfied with their bodies than are white and multiethnic teens.

Negative outcomes associated with body dissatisfaction include eating disorders (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Yates et al., 2004), low self-esteem, and higher body mass index (BMI; Paxton, Eisenberg, & Neumark-Sztainer, 2006; Presnell, Bearman, & Stice, 2004; Stice & Whitenton, 2002). Daniels (2005) found that depressive symptoms in adolescents were related to perceived weight status and dieting behaviors. Freedman, Khan, Serdula, Galuska, & Dietz (2002) found no relationship between self-reported depressive symptoms and BMI, possibly because of the obsession with thinness in the Western culture.

Gender differences have been found in the prevalence of body dissatisfaction studies. Current research indicates that although a greater percentage of boys than girls are overweight, girls tend to be less satisfied than boys with their shape and weight (Jones, Fries, & Danish, 2007). In addition, girls have more psychological problems related to their weight, including depression and body dissatisfaction, than do boys (Martyn-Nemeth, Penckofer, Gulanick, Velsor-Friedrich, & Bryant, 2009). Adolescents are more likely to experience psychosocial issues than are school-age children (Swallen, Reither, Hass, & Meier, 2005). Adolescents are undergoing dramatic physical and emotional developmental changes as well as searching for their identity, which is not the case in school-age children.

Differences in body dissatisfaction between different ethnic groups have been reported. White girls are more likely than African American girls to view themselves as overweight (Jones et al., 2007; Neff, Sargent, McKeown, Jackson, & Valois, 1997). Neumark-Sztainer, Croll, Story, Hannan, French, and Perry (2002) explored differences in weight-related concerns among 4,746 adolescents from different ethnic groups. African American girls tended to report less body dissatisfaction than white girls reported, whereas the body dissatisfaction reported by Latino and Asian American girls tended to be similar to or more than that reported by White girls. Body dissatisfaction reported by non-White boys was similar to or greater than that reported by White boys. Duncan et al (2006) reported similar results in 11- to 14-year-old British children, finding significant positive relationships between body dissatisfaction and body fat for the overall sample and finding that Asian children had the most body dissatisfaction. Research exploring the relationship between body satisfaction, BMI, physical activity, and sedentary activity is limited. Body dissatisfaction is often assessed in the context of being a barrier to healthy behaviors, including participation in physical activity, or in the context of making unwise dietary choices. Taylor et al. (1999) explored barriers to physical activity in 34 African American and Latina adolescent girls and found that having fun, social support, and concerns with body image are related to increased physical activity. In contrast, negative experiences during physical education, limited opportunity, and concerns about appearance after activity were deterrents to participating in physical activity.

The aim of our study was to explore factors related to body dissatisfaction in California adolescents and to investigate gender and ethnic differences. Understanding factors related to body dissatisfaction in adolescents can help health care providers and

researchers develop culturally sensitive and gender-specific programs to improve adolescents' perception of body image.

Methods

The 2005 California Health Interview Survey (CHIS), the largest population-based state health survey in the United States, is a random-digit-dial telephone survey of 45,649 households. A total of 4,029 adolescents from 12 to 17 years old were eligible for inclusion in the study. A subset of 1,807 White, Latino, and Asian adolescents had completed data on body image variables. Adolescents whose parent or legal guardian answered the CHIS 2005 adult questionnaire were eligible to participate. Parental permission and adolescent consent were required to conduct the interview.

The CHIS sampling design provides estimates of health-related behaviors for the overall population of California, including the largest ethnic/racial groups and several smaller ethnic/racial groups of interest. Data are input directly into a computer during the interview process. The diverse population that California represents is created by purposefully oversampling various ethnic groups (Korean and Vietnamese) to increase generalizability of the results (CHIS, 2007a). The survey is administered in five languages (English, Spanish, Chinese [Mandarin and Cantonese], Korean, and Vietnamese) to capture the rich diversity of the California population (CHIS, 2007b).

Survey data were collected by using a multistage random-digit-dial telephone survey, with 41 geographically defined sampling strata, a large sample, and deliberate oversampling of several ethnic populations. In those households with adolescents (12-17 years old) and/or children (<12 years old), one adolescent and one child were randomly selected; the adolescents were interviewed directly after consent for participation was

obtained from the parent, and the adult most knowledgeable about the child's health completed the child interview. Data were collected on 43,020 adults and 4,029 adolescents. Detailed descriptions of the sampling and data collection methods can be found in the CHIS 2005 Methodology Series (CHIS, 2007a; 2007b).

Variables

Body Dissatisfaction

The body dissatisfaction variable was tabulated by scoring the following factors: self-rated perception of one's body size (very underweight and very overweight = dissatisfied with body = 1, slightly underweight, about right, and slightly overweight = satisfied with body = 0), whether or not currently trying to alter weight (lose weight, gain weight = dissatisfied with body = 1, stay same weight, not do anything = satisfied with body = 0), whether had dieted to alter weight in the past 7 days (yes = dissatisfied = 1, no = satisfied = 0), whether had exercised to alter weight in the past 7 days (yes = dissatisfied = 1, no = satisfied = 0). The total score was used as the measure of body dissatisfaction, with higher scores indicating higher body dissatisfaction.

Socioeconomic and Demographic Characteristics

Parents provided information related to household income (which was converted to the percentage of federal poverty level). The adolescent (12-17 years old) provided information related to self-reported age, gender, and race/ethnicity.

Body Mass Index

Adolescents' self-reported weight and height were used to compute BMI (calculated as the weight in kilograms divided by height in meters squared). BMI varies with age and gender, so a specific BMI reference value based on the growth charts of the

Centers for Disease Control and Prevention (www.cdc.gov/growthcharts) was used. Adolescents with a BMI greater than the 95th percentile were considered obese, those with a BMI in the 85th percentile or higher were overweight, those with a BMI less than the 85th percentile and greater than the 5th percentile were normal weight, and those with a BMI less than the 5th percentile were underweight.

General Health Status

Adolescents were asked to assess their general health status by responding to the question "In general, would you say your health is excellent, very good, good, fair or poor?" This measure was evaluated on a scale of 1 to 5, with 5 representing excellent.

Physical Activity

Adolescents were asked "over a typical week, on how many days are you physically active for at least 60 minutes total per day?" Physical activity was dichotomized into more than 3 days with 60 minutes total per day versus fewer than 3 days with 60 minutes total per day (based on recommendations of the American Academy of Pediatrics).

Screen Time

For screen time, representing sedentary activity, adolescents were asked to "think about your free time on Monday through Friday; on a typical day, about how many hours do you usually watch TV, play video games, or use the computer for fun, not schoolwork?" This same question was asked about weekend days. A new variable was created to represent the average daily screen time. This variable was further classified into less than 2 hours of screen time per day versus 2 hours or more per day (based on the

American Academy of Pediatrics recommendation of less than 2 hours of screen time per day).

Statistical Analysis

The final full sample weights and the paired jackknife replicate weights required for the CHIS complex survey data were used to tabulate descriptive statistics, means, and standard deviations for the continuous variables and frequencies and percentages for the categorical variables. Contingency tables and chi-square statistics were used to examine relationships between these independent variables and body dissatisfaction. Regression of body dissatisfaction on BMI was tested for linear and quadratic effect, and a linear relationship was found. Simple logistic regressions were generated for each of the independent variables (BMI, physical activity, screen time, general health status, race/ethnicity, age, and gender) to predict the ordinal body dissatisfaction outcome variable (0-5 scale, with high values indicating poor body image). An ordinal logistic regression was then performed to examine the interrelationships between all of the independent variables and body dissatisfaction simultaneously (ordinal scale 0-4). All analyses were performed by using the STATA/PC statistical program (version 9 for windows; STATA, College Station, Texas). A *p* value less than .05 was accepted as significant for the model.

Results

General Characteristics

A total of 1,807 California adolescents aged 12 to 17 years were included in the analysis. The sample included Whites (61.5%), Latinos (29.3%) and Asians (9%). Among the adolescent respondents, 33.3% were 12 to 13 years old, 35.4% were 14 to 15

years old, and 31% were 16 to 17 years old. Fifty-five point three percent were girls and 44.7% were boys. Approximately 62% of the sample was normal weight (≤85th percentile) leaving 38% who were considered overweight and obese (>85th percentile); of that 38%, 18.5% were considered obese (≥95th percentile). Only 19% met the American Academy of Pediatrics recommendation of less than 2 hours of screen time per day; the mean screen time for all adolescents was 3.74 hours per day (*SD* = 0.07). Screen time varied by gender and ethnicity, with Asians viewing 1 hour more than Whites and Latinos ($p < .05$). Seventy-four percent of adolescents participated in more than 3 hours of physical activity per week. The mean days of physical activity (with standard deviations in parentheses) varied by ethnicity: 4.1 (0.07) for Whites, followed by 3.75 (0.12) for Latinos and 3.23 (0.19) for Asians. Forty-eight percent of the sample reported their general health status as very good or excellent, 36% as good, and 14% as fair with only 0.4% reporting poor ($F = 3.02$, $p = .03$). Overall, 23% reported body dissatisfaction with Latina girls (28%) and Asian boys (29%) reporting the highest percentage of body dissatisfaction compared with the other subgroups. Table 12 summarizes the prevalence of these factors, broken down by the gender and ethnicity of the adolescents.

Body Dissatisfaction

Approximately 24% of girls were dissatisfied with their bodies, compared with 22% of boys ($p < .05$). Twenty-seven percent of Latinos and Asians were dissatisfied with their bodies, compared with 19% of Whites. Adolescents who reported poor/fair general health status (51%) were more likely to be dissatisfied with their bodies than were adolescents reporting very good or excellent general health (35%) ($F = 5.90$, $p < .01$). More than twice as many adolescents whose BMI was in the 85th percentile or

higher were dissatisfied (37%) with their body image than were satisfied (15%; $F = 50.39$, $p < .01$). Reports of body dissatisfaction did not differ with respect to age, screen time, and physical activity (Table 13).

Factors Associated With Body Dissatisfaction

Univariate logistic regressions were performed to determine the individual factors that contribute to body dissatisfaction in California adolescents in three ethnic groups. General health status, $F(3, 76) = 3.02$, $p = .03$, and BMI, $F(1, 78) = 9.07$, $p < .01$, were significant in contributing to body dissatisfaction. Adolescents who reported poor health were four times more likely to report body dissatisfaction than were adolescents reporting excellent health ($p < .01$). Adolescents whose BMI was in the 85th percentile or higher were almost three times more likely to report body dissatisfaction than were adolescents whose BMI is below the 85th percentile.

Ordered logistic regression was performed to assess the impact of a number of factors on the likelihood that adolescents would report body dissatisfaction. Model 1 contains seven independent variables (physical activity, screen time, gender, age, race, general health status, and BMI). The full model containing all predictors was statistically significant, $F(7, 72) = 17.02$, $p < .01$, indicating that the model could be used to distinguish between respondents who reported and respondents who did not report body dissatisfaction. Only three of the independent variables made a unique statistically significant contribution to the model (gender, general health status, and BMI). The odds ratio of 0.68 for gender was less than 1, indicating that male respondents were 0.68 times less likely than females to report body dissatisfaction. Similarly the odds ratio for general health status was also less than one (0.74), indicating that with each unit increase in

general health status, an adolescent was 0.74 times less likely to report body dissatisfaction. The strongest predictor of reporting body dissatisfaction was BMI, with an odds ratio of 2.4.

An ordered multiple logistic regression model based on gender and ethnicity was formulated to determine risk factors for body dissatisfaction. The overall models for each gender and ethnic group were statistically significant (Table 3). BMI was a statistically significant contributor to body dissatisfaction in all genders and ethnicities. General health status was significant for White and Latina girls and for White boys. White girls are 2.59 times more likely to be dissatisfied with their body for each unit increase in BMI ($p < .01$). As White girls' general health status decreased, the odds ratio of body dissatisfaction increased 1.29 times ($p = .04$). Latina girls were 2.82 times more likely to have body dissatisfaction for each unit increase in BMI ($p <.01$). As general health status in Latina girls decreased, the odds ratio of body dissatisfaction increased 1.64 times ($p < .01$). Asian girls have the greatest risk of body dissatisfaction and are more likely to be dissatisfied with their bodies with each one unit increase in BMI (odds ratio, 28.3 times [$SE = 34.37$, because of small sample size] $p < .01$). Physical activity also contributed to body dissatisfaction in Asian girls. Asian girls who were active less than three times per week were 5.59 times more likely to report body dissatisfaction ($p < .01$). White boys are 2.57 times more likely to be dissatisfied with their bodies with each one unit increase in BMI ($p < .01$). As White boys' general health status decreases, the odds of body dissatisfaction increase by 1.6 times ($p < .01$). Latino boys are more likely to report body dissatisfaction as BMI increases (OR = 1.78, $p < .01$). Asian boys have the second highest risk of body dissatisfaction related to BMI. For each one unit increase in BMI,

their risk of reporting body dissatisfaction is approximately 5 times greater. Screen time was a contributing factor only in Asian boys. This group also had the highest percentage of screen time compared with all the other groups (5.02 hours/day).

More similarities than differences were noted among ethnicities and gender. The unique differences are found in the Asian boys and girls and are related to sedentary and physical activity.

Discussion

Body dissatisfaction exists throughout childhood but increases in prevalence in adolescence (Stice & Whitenton, 2002). In our study, 23% of adolescents reported body dissatisfaction. Much has been published about body image in children and adolescents, driven primarily by concerns related to dieting in girls. Adolescent girls have a higher prevalence of body dissatisfaction than their male counterparts (Stice & Whitenton, 2002; van den Berg, Paxton, Keery, Wall, Guo, & Neumark-Sztainer, 2007), and we found this to be true in our study, with 24% of girls and 22% of boys reporting dissatisfaction with their bodies. Ayala, Mickens, Galindo, and Elder (2007) reported that 76% of the girls and 61% of the boys in their study reported a desire to be thinner; these percentages are much higher than the rates reported by Neumark-Sztainer, Story, et al. (2002). The difference in prevalence of body dissatisfaction may be due to the different samples and the various measures of body dissatisfaction used in these studies. Nonetheless, the prevalence of body dissatisfaction is relatively high in adolescents, especially in girls.

Results of our study also suggest gender and ethnic differences in body dissatisfaction, with Asian boys reporting the highest body dissatisfaction scores (29%), closely followed by Latina girls with 28%. Asian girls (26%) and Latino boys (25%)

were next, with White girls (21%) and White boys (17%) having the least body dissatisfaction. Our results are similar to those of the study by Neumark-Sztainer, Croll, et al. (2002). They explored ethnic/racial differences in weight-related concerns and indicated that compared with White girls, African American girls reported higher body satisfaction, whereas Latina, Asian American, and Native American girls reported similar concerns or more concerns than White girls reported. Body dissatisfaction among non-White boys was equal to or more prevalent than that among White boys. Duncan et al. (2006) also found that body dissatisfaction and body fatness varied across ethnic groups, with this association being greatest in Asian children compared with African American or White children. The difference in body dissatisfaction across gender and ethnicity may be due to different emphases on the meaning of beauty across gender and ethnicity. Published reports on ethnic/racial differences in body dissatisfaction indicate that risk factors vary by both gender and ethnicity. Neumark-Sztainer, Croll et al. (2002) reported that Latino girls had the highest odds of reporting body dissatisfaction, followed by Asian American girls compared with White girls. The possible explanations for these findings could be that boys tend to want bigger and more muscular bodies, which would explain Latino and Asian boys having less body dissatisfaction despite their higher BMIs, and girls strive for thinness, which might explain the high rate of body dissatisfaction in Latina girls.

Besides gender and ethnicity differences, overweight adolescents also reported higher levels of body dissatisfaction than their normal-weight counterparts reported (37% vs 15%). Body dissatisfaction has been linked to overweight and obesity in children, demonstrating a reciprocal relationship. The relationship between BMI and body

dissatisfaction has been explored, with conflicting findings. Van den Berg et al. (2007) found a moderate to strong correlation between body satisfaction and BMI in adolescent boys and girls. Yates et al. (2004) also found a high correlation between body dissatisfaction and BMI across genders. Adolescents may experience a perceived pressure from the media and peers to be thin because of repeated societal messages telling them that they are not thin enough, which foster body dissatisfaction. Adolescents who are overweight or obese may have more body dissatisfaction because of intense pressure from our society to strive for the "ideal" and thin body type.

In our study, we found differences among gender and ethnicity related to factors that contribute to body dissatisfaction. One factor that consistently was predictive of body dissatisfaction was a general health status perceived as poor or fair. We found that 51% of teens reporting poor or fair health were dissatisfied with their body ($p < .05$). Our findings are consistent with results of other studies. Swallen et al. (2005) reported that being overweight was a significant predictor of general health. Similarly, we found that general health status was predictive of body dissatisfaction, and this was also true when gender and ethnicity were controlled for. In addition, Neumark-Sztainer, Story, Resnick, Garwick, & Blum (1995) reported that adolescents with chronic illness and poorer reported general health have more body dissatisfaction than do similar adolescents without chronic illness. This difference might be a reflection of adolescents' dissatisfaction with their chronic illness as an additive factor contributing to overall body dissatisfaction. Published reports suggest that adolescents with body dissatisfaction are more likely to participate in unhealthy behaviors (e.g., smoking, disordered eating, no physical activity; Neumark-Sztainer, et al., 2006) and report depression (Stice, Hayward,

Cameron, Killen, & Taylor, 2000). Adolescents who are dissatisfied with their body may also have poorer health habits, which could explain the association between body dissatisfaction and a general health status reported as poor or fair. Further research is needed to explore the relationship between body dissatisfaction and perceived health status in adolescents.

Research has been done to explore the relationship between physical activity and body satisfaction, pointing to body dissatisfaction as a barrier and facilitator to participation in physical activity (Allison, Dwyer, Goldenberg, Fein, Yoshida, & Boutilier, 2005; Robbins, Pender, & Kazanis, 2003; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003). In our study, the model for Asian girls indicated a relationship between low levels of physical activity and body dissatisfaction, a finding that has been reported in other studies. Duncan et al. (2006) found that physical activity had a negative correlation with children's body dissatisfaction, particularly in Asians. However, in our study, all groups except for Asian girls showed no relationship between decreased physical activity and body dissatisfaction, a finding that has been reported before (Frost & McKelvie, 2005; Tiggerman & Williamson, 2000). In our study, it is unclear why decreased physical activity was not a predictor of body dissatisfaction in any group but Asian girls. Perhaps, the self-reporting measure of physical activity is not sensitive enough to capture physical activity in adolescents. Future research should use more objective measures of physical activity and examine the contribution of physical activity to body dissatisfaction.

Our findings suggest that a quarter of California adolescents reported being dissatisfied with their body and that poorer general health status and being overweight are

factors that contribute to body dissatisfaction in California adolescents. To our knowledge, this is the first study that used a large population data set to examine factors related to body dissatisfaction among White, Latino, and Asian adolescents in California. One of the strengths of this study was the large sample size, which allowed for the investigation of multiple factors that could contribute to body dissatisfaction in California teens. Also the diverse sample enabled exploration of potential ethnic/racial differences in body dissatisfaction. A limitation of the study is the small Asian American sample. This ethnic category was formulated by combining all Asian populations, which most likely masked differences that exist among different Asian subgroups. The sampling via random-digital dialing limited access to only those teens that lived in a household with a landline telephone.

Conclusions

California along with Western culture has a preoccupation with thinness as a marker of beauty and health, which may put adolescents at a higher risk for psychological ramifications. Body dissatisfaction is a health issue in California teens that must be addressed. Our study found ethnic and gender differences in body dissatisfaction as well as differences in the factors contributing to body dissatisfaction. According to Daniels (2005), adolescents are particularly vulnerable to these views because self-identity with the emphasis placed on “fitting in” is of paramount importance for this age group and is developmentally within normal limits. An understanding of the similarities and differences in body dissatisfaction among ethnic groups may provide a better understanding of the sociocultural influences of this factor. Health care providers must screen for and help foster healthy perception of weight, body image, and general health in

adolescent patients. Ultimately increasing our knowledge in this area will enable us to guide the development of more effective interventions aimed at helping adolescents get a healthier perception of body image, general health status, and the impact of those factors on overweight.

CHAPTER SEVEN

Summary, Limitations, and Implications of the Study

The purpose of this final chapter is: 1) to briefly summarize the findings of this study and examine the relationships among the outcomes explored (overweight, physical inactivity, and body dissatisfaction) and the research questions; 2) to discuss the significance of the findings in light of current research; 3) to delineate the limitations of the study; and 4) to present the implications of the study for nursing practice and future research.

Meaning of Findings in Relation to Study Framework and Research Questions

This study sought to explore the factors that influence overweight, physical activity and body dissatisfaction among white, Latino, and Asian American adolescents in California. The ecological model for childhood obesity (Davision and Birch 2001) was used as a conceptual framework for understanding adolescence in context, and for recognizing the influence of the meso-, macro-, and micro-systems. Additionally, an explanatory model was developed to illustrate the relationship between the nested layers described by the social ecological model and its influence on the dynamic Law of Thermodynamics, which represents the delicate balance between energy in and energy out, and finally, the similarities and differences in the factors that contribute to the study outcomes of overweight, decreased physical activity, and body dissatisfaction. The conclusions reached in this study indicate a need for culturally and gender-specific

interventions that incorporate the specific modifiable and non-modifiable variables that impact each ethnic group.

At first glance, the simple Law of Thermodynamics seems to be a logical solution for the current epidemic of obesity among California adolescents. The first law of thermodynamics states that energy cannot be created or destroyed; rather, the amount of energy lost in a steady state process cannot be greater than the amount of energy gained. This law explains how "normal" weight can only occur with a perfect balance between energy in (food consumption) and energy out (PA and sedentary activity). Much of the literature exploring the issue of childhood obesity over the past several decades has focused on dietary intake and physical and sedentary activities as the main targets for interventions. Admittedly, interventions directed at these areas do impact weight status in children, but they do not create sustainable changes.

This dissertation is based on the ecological model for childhood obesity and considered various factors that are proposed to relate to overweight. According to the proposed explanatory model, children are affected not only by adolescent characteristics (age, gender, BMI, regular breakfast consumption, general health status, body dissatisfaction, PA, and sedentary activity), but also by the immediate social and physical environments, which include variables specific to family/peers and school (parents' PA, parents' BMI, parents' education level, and partaking in family meals). The model also supports the broader impact of the community on adolescents. Social and community characteristics play an important role in the development of childhood obesity. The variables explored at this level include SES, ethnicity, and acculturation. The ecological model posits that the current obesity epidemic is a direct result of the environment in

which we live, and that various influential factors within the environment may vary based on gender and ethnicity.

This dissertation explored three outcome variables related to adolescent obesity. Variables with the potential to increase the risk of developing overweight and decreasing physical activity and body dissatisfaction in adolescents were tested to determine if they varied by gender or ethnicity. The findings of this study indicate that several of the independent variables are risk factors across outcome variables. Prior to controlling for gender, ethnicity, age, gender, ethnicity, SES, parents' education level and screen time were found to be significant risk factors for both BMI < 85^{th} percentile and physical activity < 3 days per week. Body dissatisfaction and physical activity also have two common risk factors: poor/fair general health status and BMI > 85^{th} percentile.

Understanding the common risk factors among these health behaviors can aid in designing effective interventions. Additional risk factors might have been found between body dissatisfaction and overweight status had all study variables been examined across outcomes (Table 15), a topic for future research. One risk factor that is common throughout outcomes is BMI. Increased BMI is associated with decreased physical activity and increased body dissatisfaction. BMI must be considered in the context of the individual so that interventions that are meaningful for individual adolescents can be developed.

Breakfast consumption and partaking in family meals were investigated in relation to overweight status. Although this study did not examine the relationship between breakfast consumption and family meals and decreased physical activity and body dissatisfaction, skipping breakfast may impact both of these outcomes. Skipping

breakfast may lead to decreased energy levels leading to decreased PA. Alternatively, skipping breakfast may lead to overeating at lunch due to increased hunger. Both explanations may explain weight gain.

Body dissatisfaction may also be associated with skipping breakfast. Evidence confirms that skipped meals are a risk for disordered eating, which is correlated with body dissatisfaction especially in females.

Significance

Although much research investigates childhood obesity, physical activity, and body dissatisfaction, less research examines these factors in the adolescent population, and even less explores ethnic and gender differences among California youth. This dissertation aimed to explore three unique factors in white, Latino, and Asian adolescents related to obesity: being overweight (>85th percentile), being physically inactive (< 3 days of PA/week), and expressing body dissatisfaction. Although the three outcome variables were explored in isolation, overlaps were found in independent variables and it was determined that the potential for interventions targeting one ethnic group could potentially benefit others (see figure 3).

Increased BMI was determined to be significant across outcomes, impacting the amount of physical activity an adolescent in California participates in, as well as the degree of body dissatisfaction. Adolescents with BMIs > 85th percentile were less likely to be physically active and more likely to be dissatisfied with their bodies. This dissertation documents variability by ethnicity and gender. I find that Latino youth are

more likely to be overweight than Asians and whites. Additionally, females report higher levels of inactivity and body dissatisfaction than males regardless of their ethnicity.

By developing culturally sensitive and gender-specific interventions to reduce BMI, the potential exists to impact both physical activity levels and body satisfaction in the California adolescent population.

In an attempt to better understand the risk factors associated with being overweight among California adolescents, several independent variables were considered. In this study only regular breakfast consumption significantly predicted becoming overweight in some but not all subgroups. In previous research, regular breakfast consumption and eating family meals have been shown to reduce the risk of obesity in children (Berkey, Rocket, Gillman, et al. 2003; Parizkova 2008; Pearson, Biddle, & Gorely 2009). However, it is unclear why regular breakfast consumption was not a risk factor across ethnicity and gender. Understanding the importance of regular breakfast consumption may require additional research to fully understand its impact on weight. Family meals were not a significant predictor of overweight in California adolescents. Nevertheless, several studies have found positive correlations between eating family meals and decreased fast-food intake (Burgess-Champoux, Larson, Neumark-Sztainer, et al. 2009).

Differences in findings may be due to differences in the ages of the population being studied. According to several longitudinal trend studies, fast food consumption increases during the adolescent years (Larson, Neumark-Sztainer, Story, et al. 2008; Niemeier, Raynor, Lloyd-Richardson, et al. 2006; Schmidt, Affenito, Striegel-Moore, et al. 2005). As children grow older they have increasing independence and autonomy around food choices and meal times (Bauer, Larson, Nelson, et al. 2009), such that case

interventions developed around fast-food consumption may have a significant impact on the eating behaviors of this group.

In this study, I explored several common risk factors that linked being overweight and having low level of physical activity. These common risk factors included SES, age, gender, parents' education level, ethnicity, and inactivity. Adolescent females who were older (16-17 years), who had household incomes < 199 percent of the FPL, and whose parents had a low level of education, were at greatest risk for being overweight and inactive.

With the exception of lack of activity, all of these risk factors are considered non-modifiable. Although the non-modifiable risk factors cannot be remedied through interventions, targeting individuals or groups in these specific areas can and should be done.

Sedentary activity, which was measured by screen viewing time > 2 hours/day, is the only modifiable risk factor identified for increased BMI and decreased PA. Approximately 79 percent of the sample spent more than 2 hours/day watching television, with a mean viewing time of almost 4 hours per day. Our study also indicated that white adolescents are the most active, having moderate levels of sedentary activity; Latino adolescents were less active but had less sedentary activity time in comparison to Asian adolescents, who had low levels of PA and high rates of sedentary activity. The literature indicates that sedentary and physical activities are not mutually exclusive behaviors and that adolescents' who participate in high levels of PA and high levels of sedentary activity may not decrease their risk for being overweight
(Biddle, Gorely, Marshall, et al. 2004; Spanier, Marshall, & Faulkner 2006).

PA in Latino and Asian immigrants has been shown to increase generationally. Fifty-seven percent of first-generation Asian adolescents reported being physically active (30 minutes of MVPA for three days in past week) compared to 68 percent of first-generation Latinos and 77 percent of whites. In contrast, 81 percent of third-generation Asians and 74 percent of third-generation Latinos reported being physically active (Allen, Elliott, Morales, et al. 2007).

Several potential causes have been suggested to explain the relationship between sedentary activity (TV, computer, and video games) and overweight in adolescents and children: less time for PA (Jenvey 2007); increased snack food consumption among children who watch more TV (Epstein, Roemmich, Paluch, et al. 2005; Sonneville & Gortmaker 2008); increased viewership of food and beverage advertisements on television especially among young children (Veerman, Van Beeck, Barendregt et al. 2009) but also among adolescents (Powell, Szczypka, & Chaloupka 2007). Other studies have also supported the notion that increased sedentary activity increases risk for overweight.

Must and Tybor (2005) reviewed 20 longitudinal studies of sedentary activity and its effect on weight. Results were mixed, but most showed a direct association with sedentary activity and increased BMI, although many of the associations were small. Wong and Leatherdale (2009) found that levels of both physical and sedentary activity (i.e. high activity/low sedentary behavior, high activity/high sedentary behavior, low activity/high sedentary behavior, and low activity/low sedentary behavior) had different impacts on the relative risk for overweight. Their work suggests that both PA and sedentary activity must be considered when trying to understand the risk factors associated with overweight and inactivity.

Considering both PA and sedentary activity is important for developing interventions as well. Additional studies are necessary to further understand whether there is a moderating effect between physical activity and sedentary activities in California adolescents.

We also explored parents' acculturation level, parents' level of PA, parents' BMI, and parents' level of education in order to better understand the risk factors related to decreased PA. Ninety-four percent of parents in this study were either born in the United States or had lived in the U.S. for more than 10 years, which suggests a highly acculturated group. Research suggests that increased acculturation level correlates with increased level of physical activity. My findings largely concur. I found that increased acculturation level was associated with increased level of physical activity among all ethnic and gender groups. The sole exception was Latino males (Everson, Sarmiento & Ayala 2004; Unger, Reynolds, Shakib, et al. 2004).

It is unclear why acculturation level does not play a significant role in Latino males. Results of this study must be interpreted carefully as only a small number of participants had low levels of acculturation. Nonetheless, to develop culturally sensitive interventions related to overweight and PA that target ethnic minorities, level of acculturation must be considered.

As for body dissatisfaction, many studies have shown that female adolescents are dissatisfied with their weight and shape and prefer thinner physiques (Jones, Fries, & Danish 2007). In contrast, males, in general, are satisfied with their shape and size, with some wanting larger or more muscular builds (Peixoto-Labre 2002; Stanford, & McCabe, 2005).

Parents, peers, and society contribute to the formation of what constitutes the "ideal body", but media seem to have the greatest influence (van den Berg, Paxton, Keery, et al. 2007). Two variables in this study were determined to impact both body dissatisfaction and decreased PA: perceived general health status and BMI. Increased BMI has repeatedly been shown to be a risk factor for body dissatisfaction (Padgett & Biro 2003; van den Berg, Paxton, Keery, et al. 2007), as I found as well.

California adolescents are at increased risk of having body dissatisfaction if they have a BMI > 85th percentile and report poor/fair general health. Body dissatisfaction is found among adolescents of both genders and all ethnicities when they have a BMI > 85th percentile, with the exceptions of Asians in poor/fair general health and Latino males. Interestingly, Latinas and Asian males have the poorest perceived general health and the highest rates of body dissatisfaction. Neumark-Stzainer et al. (2002) found that body dissatisfaction is highest among Hispanics and whites, followed by Asian-Americans. Disparities seen in our study might be related to cultural difference related to relative size acceptance. Among less acculturated Latinos, bigger size is sometimes equated with health and prosperity, but among more acculturated Latinos, thinness is valued.

Among white, Latino and Asian adolescents in California, being overweight and in poor/fair general health were associated with expressing body dissatisfaction. Interventions geared toward reducing BMI and improving adolescent perception of their general health are two areas that may impact body dissatisfaction directly and indirectly increase the amount of physical activity that adolescents participate in.

Adolescent obesity has traditionally been thought of as an imbalance between energy in and energy out. Current research tells us that the imbalance of energy is a

behavior-based health problem that demands a multilevel, cross-disciplinary, bidirectional explanatory model to achieve better understanding. As a result of this dissertation study, I have determined that there are commonalities among risk factors leading to overweight, decreased physical activity, and body dissatisfaction in Latino, Asian, and white California adolescents. By incorporating a multilevel approach to examining potential risk factors, and taking into consideration the overlap in these risk factors, the ground work for developing culturally sensitive and gender-specific interventions targeting these three health issues in adolescents has been made possible. Having a better understanding of the risk factors contributing to overweight, decreased physical activity, and body dissatisfaction is imperative if we hope to reverse the current epidemic of childhood and adolescent obesity.

Across outcomes, gender and ethnicity seem to contribute to differences in risk factors for overweight, decreased physical activity, and body dissatisfaction. In developing interventions to address these unhealthy behaviors, interventions that are culturally sensitive and gender specific must be developed. The current research has demonstrated that the seemingly simple equation that energy in equals energy out is insufficient to explain the associations among being overweight, level of physical activity, and level of body dissatisfaction. These phenomena are very complex and influenced by multiple layers of environmental factors. In combination, they impact the health behaviors of California adolescents (see figure 4, 5).

Limitations and Alternate Explanations

Secondary data analysis has both its strengths and limitations. The CHIS data set is characterized by large sample size, which enables researchers to make population estimates and have access to multiple data sets from which trend data can be constructed. But the limitations must also be considered. This analysis was a cross-sectional design. Any significant associations found between independent variables and the outcomes of overweight, decreased PA, and body dissatisfaction cannot be taken as proof of causation. Only a longitudinal study, which provides information about changes in individuals over time, can enable cause and effect relationships to be developed.

The method for data collection, RDD telephone survey can be an advantage because there tends to be less missing data and a reduction in non-response bias. A draw-back of the CHIS data collection was that it accessed only households with landline telephones, thus excluding households with cell phones or households without a telephone.

The CHIS data only sampled households with telephones in California; therefore the results of this population-based study cannot be generalized to another state or nationally. Also in order to have adequate sample sizes for the minority groups it was necessary to combine all subjects who self-identified as Latino, which includes many heterogeneous subgroups. This was also the case with self-identified Asians. They too comprise multiple Asian subgroups. Unique differences among these embedded subgroups cannot be discerned in this study.

Although this study uses an ecological perspective, additional factors that contribute to the outcomes described, such as the built environment (access to parks,

proximity of fast food vs. grocery stores, trails for activity) active transport, and participation in sports, would add to the information about weight status and physical activity. Data collection related to PA did not account for seasonal differences that could influence PA activity, although in light of California's generally mild climate, this limitation may have little relevance, in comparison to other parts of the country where weather markedly impacts PA participation. The CHIS does consider differences in PA related to day of the week, and collects data for week days as well as weekends.

Self-report is limited as a measure for PA due to recall issues, including poor recall, deliberate misrepresentation, and social desirability bias (Trost, Sirard, Dowda, et al. 2003) but it is supported in the literature as an effective means of measuring PA in adolescents (Weston, Petosa, & Pate 1997). In this study BMIs were calculated for subjects based on self-reported height and weight, which may have lead to misclassification of some overweight adolescents, because overweight individuals tend to overestimate their height and underestimate their weight (Himes & Faricy 2001). Nonetheless, the study results are similar to national averages in the NHANES III, where subjects had objective height and weight measures (Nationally 17.1%, our study 18.9%).

Another possible limitation of this study is using the CDC BMI percentiles rather than the 2004 World Health Organization's (WHO) International Classification for classifying underweight, overweight, and obesity according to the BMI, which is reported to be a more accurate means of assessing BMI in the Asian population. The literature supports differences in BMIs among various populations due to different body proportions. The WHO found that Asian adults have higher cardiovascular risks

associated with lower BMIs, suggesting that current BMI cut-off points underestimate fatness in the Asian population (WHO 2004).

Implications for Nursing

A potential area to target in the California adolescents is their perception of health status. In our study perceptions of general health status impacted all outcomes explored. Poor/fair general health status contributed to body dissatisfaction as well as decreased physical activity, both having the potential to affect BMI in adolescents. By assessing general health status in youth and developing interventions to address the issue of perceived poor general health nurses could potentially impact several important health behaviors identified in this study.

As the numbers of ethnic minorities continue to grow in California, it is important to develop a better understanding of health-related behaviors that impact these individuals' overall general health. Due to the highly acculturated nature of our sample it is important to access and study those individuals who have lived in the United States for shorter lengths of time, and consequently may be less acculturated. This study suggests that high acculturation increases overweight risk. An intervention targeting new arrivals to the United States that emphasizes the importance of maintaining traditional cultural beliefs around dietary behaviors could be effective. Additionally, educating this high-risk group about the benefits of regular physical activity for pleasure could decrease their level of inactivity, which is found in less acculturated groups generally.

This study has highlighted several gender and ethnic differences among California adolescents. It is imperative for health care providers to address the issue of overweight,

decreased physical activity, and body dissatisfaction on an individual basis, focusing on specific risk factors that are unique to them. By focusing on the risk factors most important to individuals, there is a higher likelihood that interventions will be successful and behavioral modifications will be sustainable.

Conclusions

The main finding in this study is that gender and ethnic variations mediate factors that contribute to overweight, decreased physical activity, and body dissatisfaction. A higher percentage of Latino adolescents, especially boys, are overweight. Females are much more likely to decrease their physical activity especially as they get older. Asian boys and girls are most likely to have low levels of physical activity and high levels of sedentary activity. Finally, females are at greatest risk for having body dissatisfaction, with Latino and white females at greater risk than Asian females. Body dissatisfaction is linked to perceptions of poor/fair general health status as well as BMIs > 85^{th} percentile. An understanding of the similarities and differences in risk for overweight, decreased PA, and body dissatisfaction among ethnic groups may provide a better understanding of the sociocultural influences of these factors, which in turn can aid in developing effective, culturally sensitive, and gender-specific interventions to produce sustainable positive health outcomes.

Future Research

Longitudinal research exploring ethnic and gender differences among factors impacting weight status, physical activity, and body satisfaction are needed. A study

exploring the same independent variables across several health-behavior outcomes might provide additional information related to overlapping risk factors, adding to the development of interventions to combat the current obesity epidemic in an ethnically diverse population.

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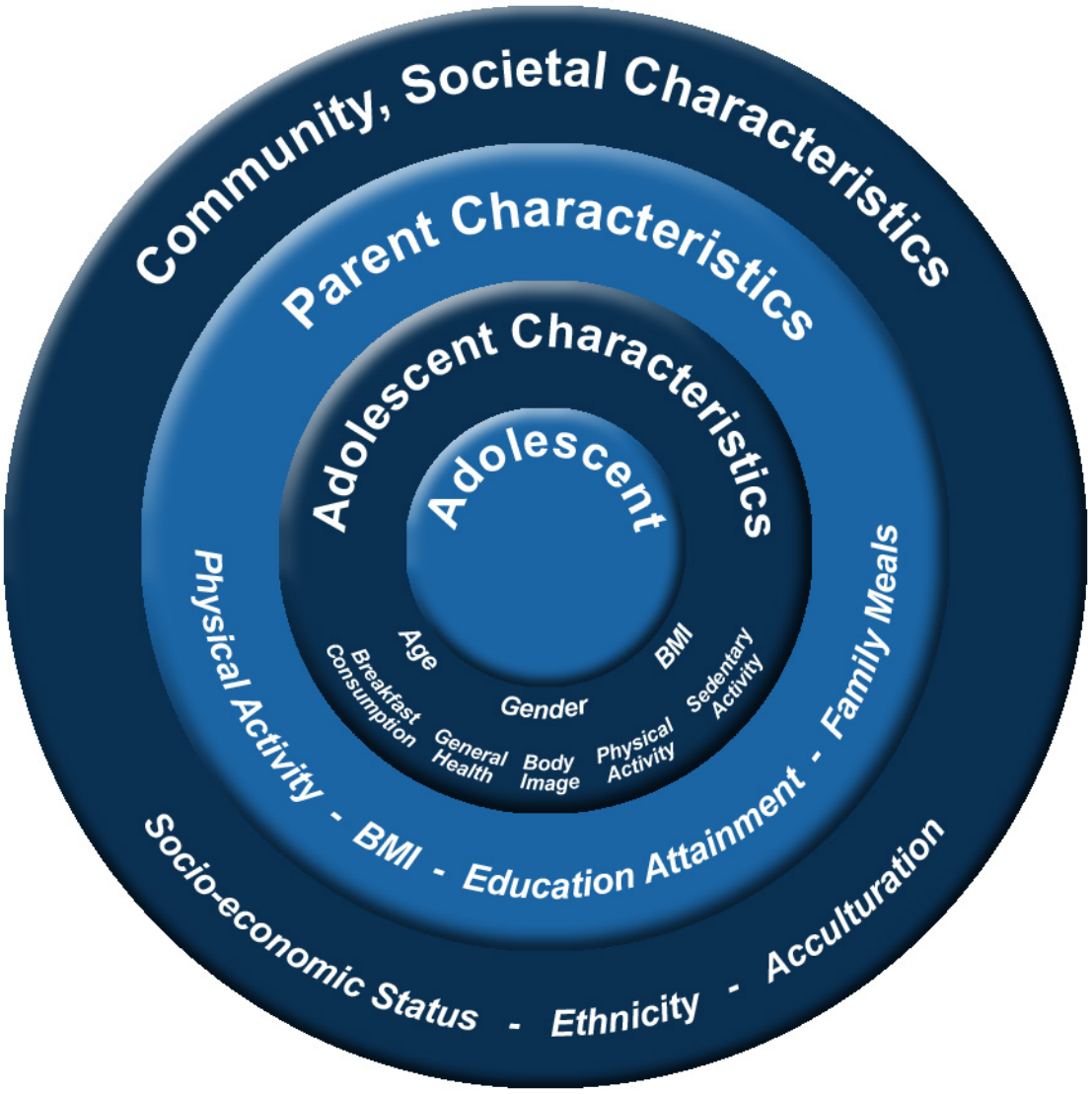
APPENDIX

FIGURES AND ILLUSTRATIONS

Figure 1 : Ecologic Model for Childhood Obesity based on California Adolescents



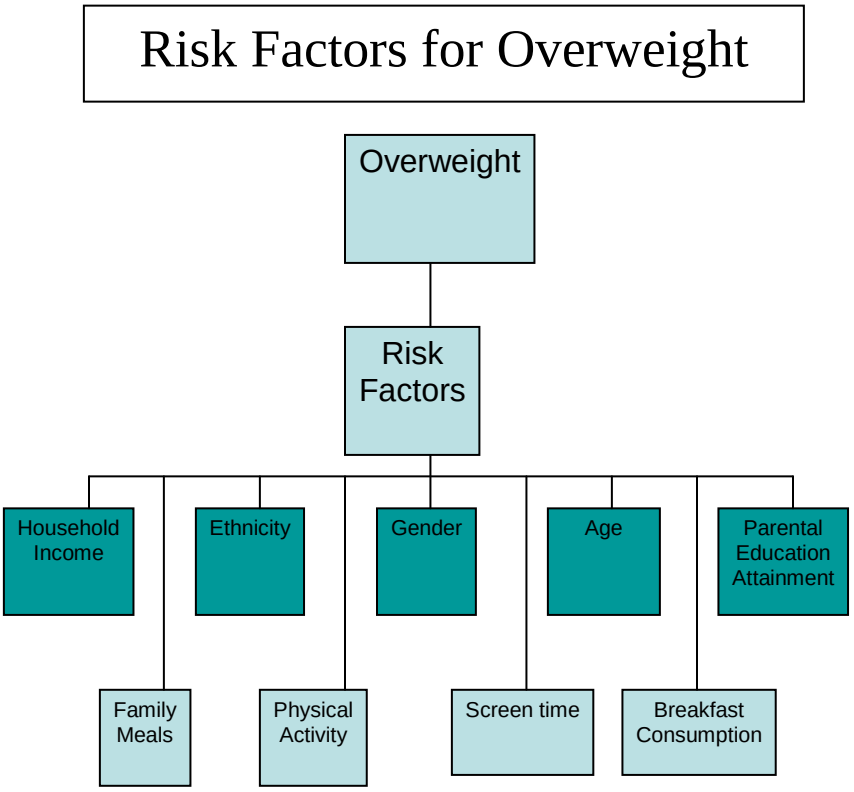


Figure 2: Risk Factors Explored in Overweight

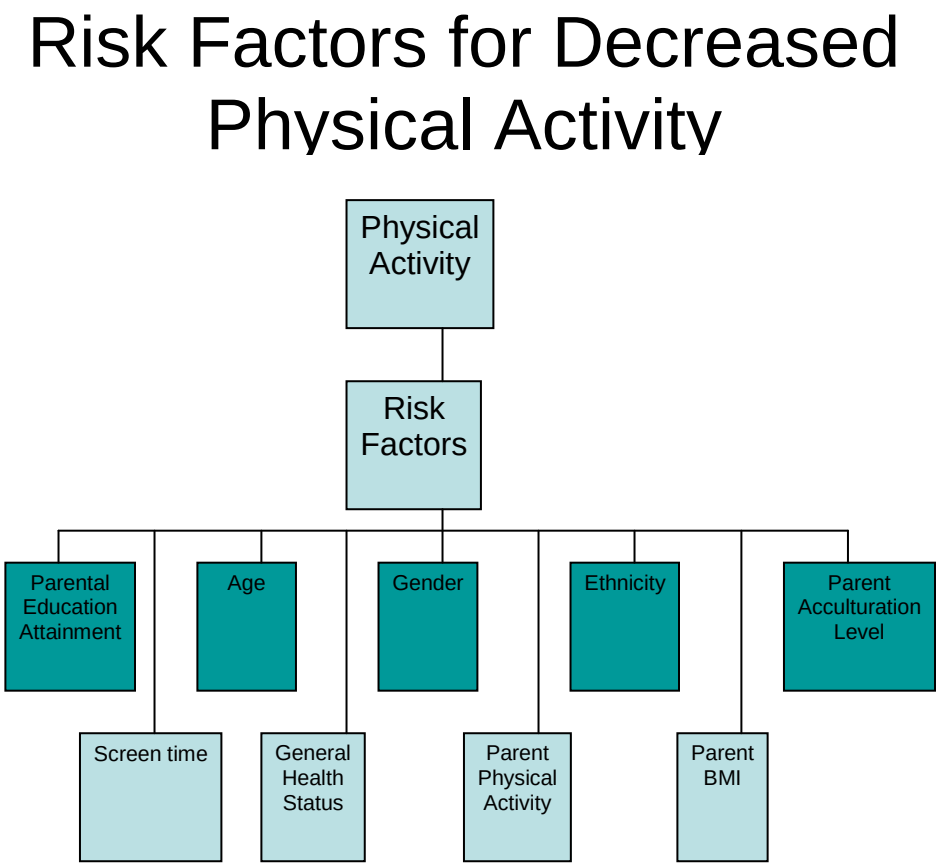


Figure 3 Risk Factors Explored with Physical Activity

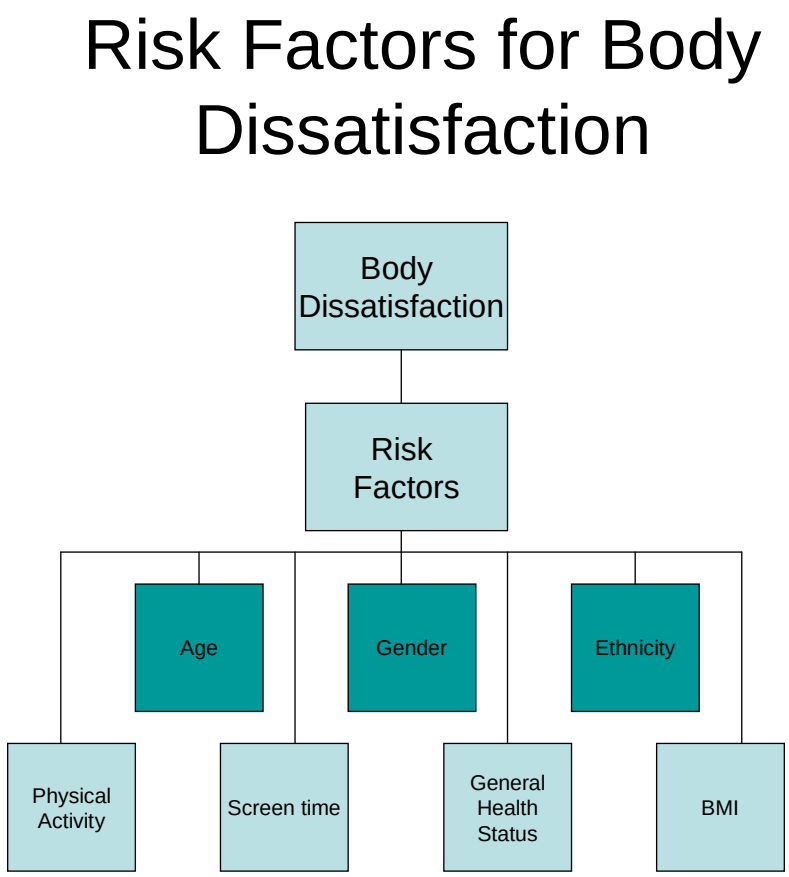
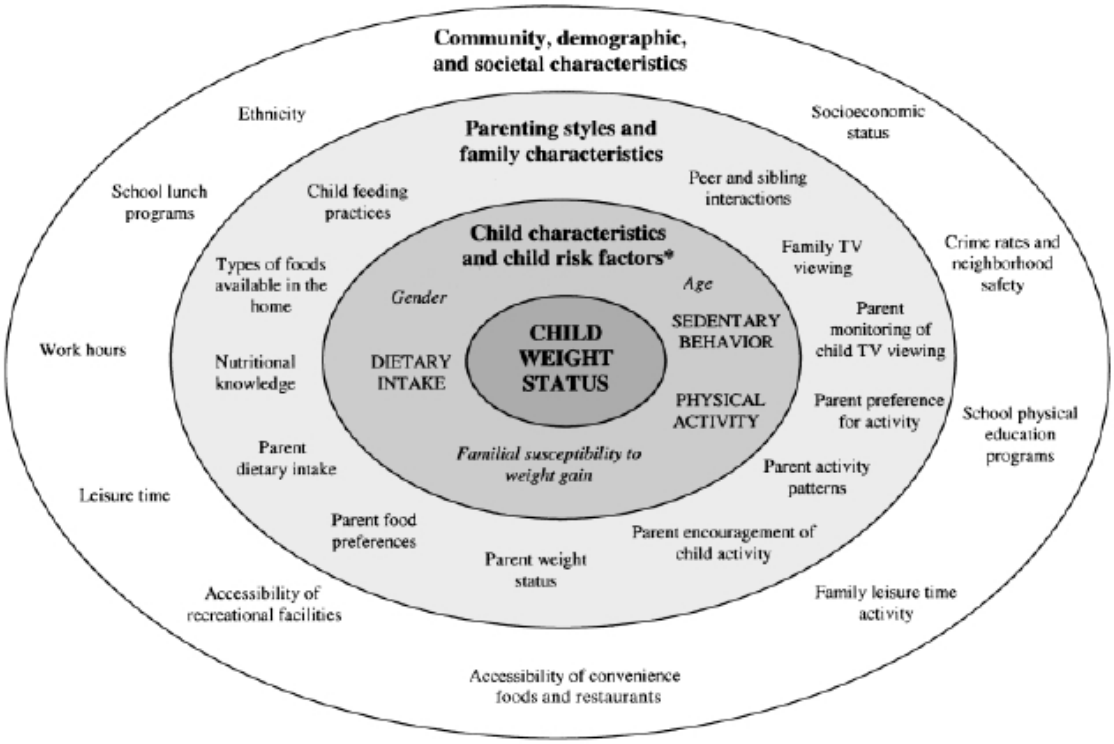


Figure 4: Risk Factors Explored Related to Body Dissatisfaction

Ecological Model for Childhood Obesity
(Figure 5)



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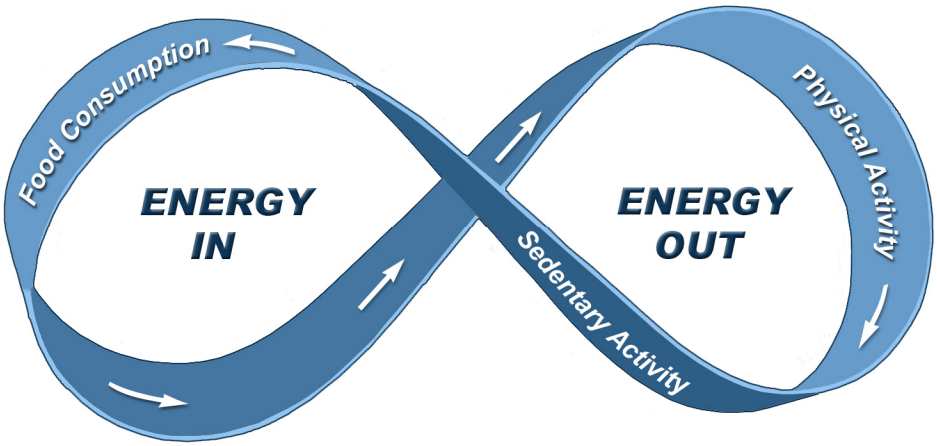
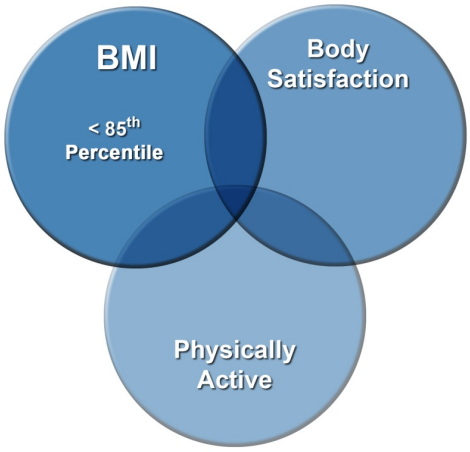


Figure 6: Mobius Strip Representing The Law Of Thermodynamics in Adolescent Obesity

Figure 7: Venn Diagram of Outcome variables



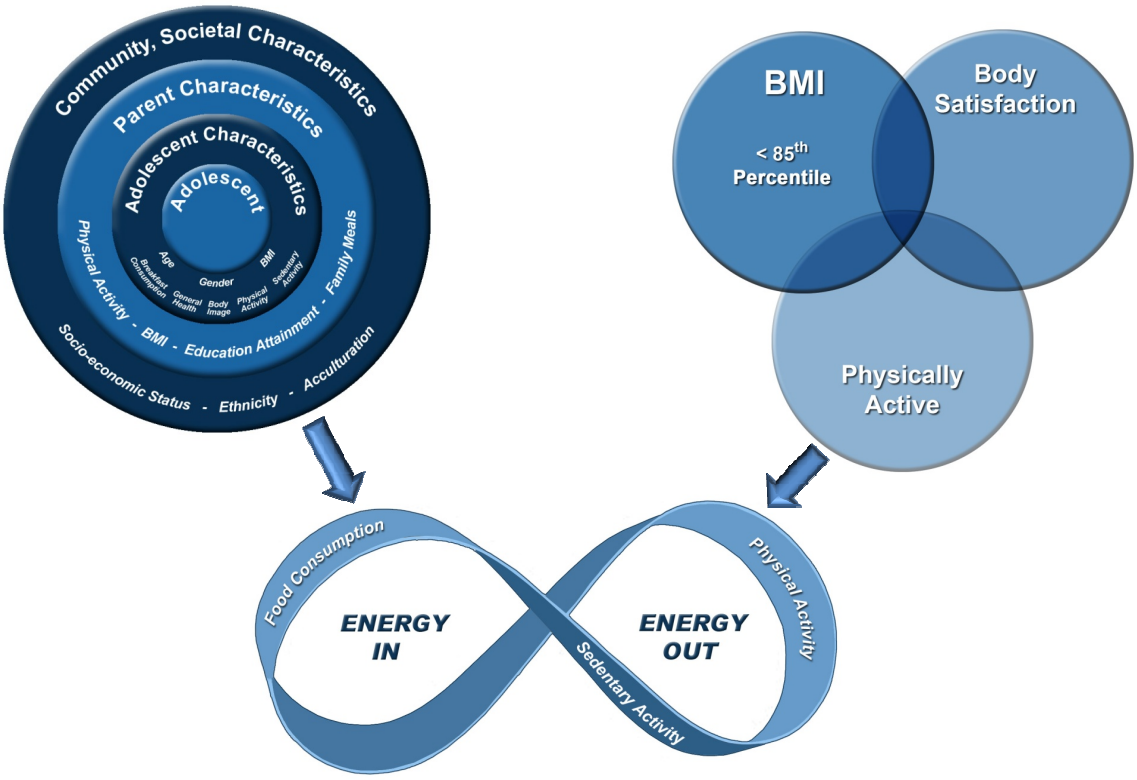


Figure 8: Explanatory Model Linking Social Ecological Theory, Law of Thermodynamics and Venn Diagram of Risk Factors

TABLES

Table 1: Percentage Distribution by Selected Characteristics: California Adolescents, California Health Interview Survey, 2005 for Overweight

	Number* (N = 3315)	**%***
Race/ethnicity		
White	2135	51.4
Latino	827	35.0
Asian American	353	13.6
Age, years		
12-13	1113	32
14-15	1172	35.3
16-17	1030	32.7
Gender		
Males	1694	51.2
Females	1621	48.8
Overweight		
<85th percentile	2377	72
>85th percentile	938	28
Parents' education		
<High school	477	21.8
High school graduate	680	21.5
Some college	561	17.1
College degree or higher	1597	39.6
Percentage of federal poverty level		
0-99	351	16.2
100-199	591	21.2
200-299	410	13.2
≥300	1963	49.4
Screen time (computer/television/video games)		
≤2 hours	653	19.1
>2 hours	2662	81
Physical activity (60 min/day of moderate activity)		
≥3 days/week	2453	74
<3 days/week	862	26
Breakfast consumption		
Does not eat breakfast every day	1598	50.3
Does eat breakfast every day	1717	49.7
Family meals		
Does not eat dinner with parent every night	1485	44.7
Does eat dinner with parent every night	1830	55.3

***Weighted to represent population.**

Table 2: Means of Continuous Variables for Overweight*

	Continuous Variable					
	Hours of Sedentary Activity					
Group	Per Day	Per Weekday	Per Weekend Day	Days With 60 Minutes of Moderate Physical Activity	Days Eats Breakfast	Days Eats Dinner With Parents
Overall						
Mean	3.82	3.35	4.29	3.90	4.99	5.43
SE	0.67	0.073	0.083	0..54	0.063	0.062
CI	3.69-3.96	3.21-3.50	4.13-4.46	3.79-4.00	4.87-5.12	5.31-5.60
Whites						
Mean	3.70			4.12	5.05	5.58
SE	0.071			0.066	0.067	0.069
CI	3.56-3.84			3.99-4.25	4.92-5.19	5.44-5.72
Latinos						
Mean	3.72			3.76	4.80	5.04
SE	0.119			0.096	0.138	0.112
CI	3.49-3.96			3.56-3.95	4.53-5.08	4.82-5.26
Asian Americans						
Mean	4.54			3.43	5.26	5.88
SE	0.183			0.170	0.166	0.069
CI	4.18-4.91			3.09-3.76	4.93-5.60	5.44-5.72
White girls						
Mean	3.47			3.73	4.92	5.45
SE	0.086			0.091	0.112	0.097
CI	3.30-3.64			3.55-3.91	4.70-5.15	5.26-5.64
Latina girls						
Mean	3.89			3.45	4.60	4.63
SE	0.162			0.133	0.191	0.183
CI	3.56-4.21			3.18-3.71	4.22-4.98	4.30-4.99
Asian American girls						
Mean	4.11			3.31	5.40	5.90

SE	.2406			0.290	0.290	0.235
CI	3.63-4.59			2.73-3.89	4.80-5.94	5.43-6.40
White boys						
Mean	3.92			4.50	5.18	5.70
SE	0.095			0.081	0.101	0.085
CI	3.73-4.11			4.33-4.65	4.98-5.38	5.53-5.87
Latino boys						
Mean	3.60			4.05	5.01	5.44
SE	0.162			0.147	0.168	0.161
CI	3.25-3.89			3.80-4.35	4.67-5.34	5.12-5.76
Asian American boys						
Mean	4.94			3.53	5.20	5.86
SE	0.285			0.240	0.231	0.217
CI	4.37-5.50			3.06-4.00	4.71-5.63	5.43-6.29

* Values are mean, standard error (SE, weighted), and 95% confidence interval (CI).

Table 3
Demographics of the Study by Gender and Race*
***Percentages in bold are weighted and represent population estimation.**

	Girls (n = 1621, 48.9%)			**Boys (n = 1694, 51.1%)**		
Characteristics	**White (n = 1070)**	**Latina (n = 407)**	**Asian American (n = 144)**	**White (n = 1065)**	**Latino (n = 420)**	**Asian American (n = 209)**
Age, years						
12-13 (n = 1113, 33.6%)	316 (30%) **(28%)**	159 (39%) **(36%)**	53 (37%) **(31%)**	350 (33%) **(29%)**	169 (40%) **(39%)**	66 (32%) **(29%)**
14-15 (n = 1172, 35.4%)	383 (36%) **(38%)**	136 (33%) **(34%)**	47 (33%) **(35%)**	373 (35%) **(34%)**	157 (37%) **(36%)**	76 (36%) **(35%)**
16-17 (n = 1030, 31.1%)	371 (35%) **(34%)**	112 (28%) **(31%)**	44 (31%) **(34%)**	342 (32%) **(37%)**	94 (22%) **(25%)**	67 (32%) **(36%)**
Parents' education						
>High school (n = 477, 14.4%)	43 (4%) **(5%)**	201 (49%) **(54%)**	13 (9%) **(15%)**	27 (3%) **(4%)**	181 (43%) **(50%)**	12 (6%) **(3%)**
High school or equivalent (n = 680, 20.5%)	227 (21%) **(23%)**	93 (23%) **(22%)**	24 (17%) **(19%)**	195 (18%) **(21%)**	100 (24%) **(22%)**	41 (20%) **(20%)**
Some college (n = 561, 16.9%)	229 (21%) **(24%)**	41 (10%) **(9%)**	15 (10%) **(12%)**	196 (18%) **(21%)**	58 (14%) **(12%)**	22 (11%) **(17%)**
College degree or higher (n = 1597, 48.2%)	571 (53%) **(48%)**	72 (18%) **(15%)**	92 (64%) **(54%)**	647 (61%) **(54%)**	81 (19%) **(16%)**	134 (64%) **(59%)**
Percentage of federal poverty level						
0-99 (n = 351 = 10.6%)	49 (5%) **(5%)**	111 (27%) **(33%)**	19 (13%) **(23%)**	34 (3%) **(4%)**	113 (27%) **(32%)**	25 (12%) **(13%)**
100-199 (n = 591, 17.8%)	118 (11%) **(13%)**	145 (36%) **(37%)**	24 (17%) **(19%)**	121 (11%) **(12%)**	149 (36%) **(34%)**	34 (16%) **(15%)**
200-299 (n = 410, 12.4%)	149 (14%) **(16%)**	44 (11%) **(9%)**	20 (14%) **(18%)**	122 (12%) **(12%)**	52 (12%) **(12%)**	23 (11%) **(17%)**
>300 (n = 1963, 59.2%)	754 (71%) **(67%)**	107 (26%) **(20%)**	81 (56%) **(40%)**	788 (74%) **(72%)**	106 (25%) **(22%)**	127 (61%) **(54%)**

Screen time (computer/television)						
≤2 hours/day (n = 653, 19.7%)	248 (23%) **(23%)**	77 (19%) **(17%)**	25 (17%) **(13%)**	193 (18%) **(16%)**	93 (22%) **(28%)**	17 (8%) **(9%)**
>2 hours/day (n =2662, 80.3%)	822 (77%) **(77%)**	330 (81%) **(83%)**	119 (83%) **(87%)**	872 (82%) **(84%)**	327 (78%) **(72%)**	192 (92%) **(91%)**
Physical activity (60 minutes of moderate physical activity/day)						
>3 days/week (n = 2487, 75%)	804 (75%) **(72%)**	264 (65%) **(66%)**	88 (61%) **(57%)**	874 (82%) **(84%)**	326 (78%) **(74%)**	131 (63%) **(63%)**
<3 days/week (n = 828, 25%)	266 (25%) **(28%)**	143 (35%) **(34%)**	56 (39%) **(43%)**	191 (18%) **(16%)**	94 (22%) **(26%)**	78 (37%) **(37%)**
Breakfast consumption						
0-6 days/week (n= 1598, 48.2%)	557 (52%) **(53%)**	220 (54%) **(52%)**	59 (41%) **(44%)**	464 (44%) **(46%)**	205 (49%) **(52%)**	93 (45%) **(53%)**
7 days/week (n = 1717, 51.8%)	513 (48%) **(47%)**	187 (46%) **(48%)**	85 (59%) **(56%)**	601 (56%) **(54%)**	215 (51%) **(48%)**	116 (56%) **(47%)**
Family meals						
0-6 days/week (n = 1485, 44.8%)	522 (49%) **(48%)**	197 (48%) **(55%)**	49 (34%) **(29%)**	475 (45%) **(44%)**	169 (40%) **(42%)**	76 (36 %) **(34%)**
7 days/week (n = 1830, 55.2%)	548 (51%) **(52%)**	213 (52%) **(45%)**	95 (66%) **(71%)**	590 (55%) **(56%)**	251 (60%) **(58%)**	133 (64%) **(66%)**
Body mass index						
<85th percentile (n = 2464, 74.4%)	875 (82%) **(82%)**	272 (67%) **(66%)**	138 (96%) **(96%)**	787 (74%) **(69%)**	247 (59%) **(59%)**	148 (71%) **(73%)**
>85th percentile (n = 850, 25.6%)	197 (18%) **(18%)**	135 (33%) **(34%)**	6 (4%) **(4%)**	278 (26%) **(31%)**	173 (41 %) **(41%)**	61 (29%) **(27%)**

Table 4
Cross Tabulations Based on Overweight Status*

	Dependent Variable		
Independent Variable	**Not Overweight, <85th Percentile**	**Overweight, >85th Percentile**	***p* (From χ^2 Test)**
Gender			<.001
Male	1182 (70%) **(66%, .017, .625-.691)**	512 (30%) **(34.%, .017, .309-.375)**	
Female	1283 (79%) **(78%, .013, .755-.807)**	338 (21%) **(22%, .013, .193-.245)**	
Ethnicity			<.001
White	1660 (78%) **(75.1%, .013, .725-.776)**	475 (22%) **(25%, .013, .224-.276)**	
Latino	519 (63%) **(63%, .022, .581-.667)**	308 (37%) (**37.5%, .022, .333-.419)**	
Asian American	286 (81%) **(84%, .025, .784-.883)**	67 (19%) **(16%, .025, .117-.216)**	
Age, years			.05
12-13	804 (72%) **(68.2%, .019, .643-.720)**	309 (28%) **((32%, .020, .280-.357)**	
14-15	865 (74%) **(74%, .015, .708-.768)**	307 (26%) **(26%, .015, .232-292)**	
16-17	796 (77%) (**73.2%, .018, .695-.767)**	234 (23%) **(27%, .018, .233-.305)**	
Physical activity			.77
Meets standard > 3 days/week	1873 (75.3%) **(72%, .013, .700-.750)**	614 (24.7%) **(28%, .013, .255-.305)**	
Does not meet standard	592 (72%) **(71.3%, .02, .670-.750)**	236 (29%) **(29%, .022, .250-.331)**	
Sedentary activity			.27
Meets standard < 2 hours/day	510 (78%) **(75%, .027, .691-.796)**	143 (22%) **(25.3%, .027, .204-.310)**	
Does not meet standard	1955 (73%) **(71%, .012, .689-.735)**	707 (27%) **(29%, .012, .265-.311)**	
Breakfast consumption			<.005

Yes	1340 (78%) **(75.1%, .014, .721-.778)**	377 (22%) **(25%, .014, .222-.279)**	
No	1125 (70%) **(69%, .016, .656-.718)**	473 (30%) **(31.2%, .016, .282-.344)**	
Family meals			.33
Yes	1354 (74%) **(73%, .013, .701-.754)**	476 (26%) **(27%, .013, .246-.299)**	
No	1111 (75%) **(71%, .020, .674-.739)**	374 (25%) **(29.2%, .016, .261-.326)**	
Parents' educational level			<.001
<High school	292 (61%) **(62%, .028, .568-.678)**	185 (39%) **(38%, .028, .322-432)**	
High school graduate	460 (68%) **(66%, .023, .610-.701)**	220 (32%) **(34%, .023, .299-.390)**	
Some college	419 (75%) **(73%, .03, .662-.781)**	142 (25%) **(27%, .03, .219-.338)**	
College degree or higher	1294 (81%) **(80.1%, .011, .778-.823)**	303 (19%) **(20%, .011, .177-.222)**	
% of federal poverty level			<.001
0-99	227 (65%) **(64%, .036, .564-.706)**	124 (35%) **(36%, .036, .294-.436)**	
100-199	378 (64%) **(66%, .254, .612-.713)**	213 (36%) **(34%, .025, .288-.388)**	
200-299	303 (73.9%) **(72%, .032, .648-.776)**	107 (26.1%) **(28%, .032, .224-.352)**	
>300	1557 (79%) **(77%, .013, .744-.794)**	406 (21%) **(23%, .013, .206-.256)**	

* Numbers in bold are weighted (percentage, standard error, 95% confidence limits).

Table 5 Multiple Logistic Regression

A. Predicting Likelihood of Overweight Adolescents

Overall Sample Variable	**Odds Ratio**	**SE**	***t***	***p***	**95% CI**
Physical activity	1.03	0.15	0.19	.85	
Screen time	1.27	0.20	1.54	.13	
Breakfast consumption	0.75	0.09	-2.42	.02	0.589-0.950
Family meals	0.93	0.11	-0.58	.6	
Gender	2.03	0.24	6.02	<.001	1.609-2.570
Age	0.87	0.06	-2.01	.048	0.766-0.999
Parents' educational level	0.76	0.05	-4.53	<.001	0.669-0.855
Poverty level	0.90	0.07	-1.35	.18	
Race	0.83	0.08	-1.92	.06	

B. Summary Table by Gender and Ethnicity

Group/Significant Factors	**Odds Ratio**	**SE**	***t***	***p***	**95% CI**
White girls (n = 1070)					
% Federal poverty level	0.68	0.08	-3.11	.003	0.528-0.869
0-99 vs ≥300	2.45	1.08	2.02	.047	1.010-5.900
100-199 vs ≥300	2.73	1.01	2.72	.008	1.310-5.700
200-299 vs ≥300	1.56	0.50	1.40	.73	0.436-1.790
Latina girls (n = 407)					
Parents' educational level <High school vs college or more	0.13	0.09	-2.85	.006	0.031-0.537
Asian American girls (n = 144)					
Parents' educational level	2.97	1.23	2.62	.01	1.300-6.780
White boys (n = 1065)					
Screen time	2.28	0.56	3.38	.001	1.405-3.710
Parents' educational level < High school vs college or more	0.26	0.17	-2.06	.04	0.070-0.950
High school/diploma vs college or more	2.10	0.53	2.94	.004	1.270-3.470
Latino boys (n = 420)					
Parents' educational level High school/diploma vs college or more	2.60	1.11	2.24	.03	1.110-6.080

Table 6: Univariate Logistic Regression, with Overweight as the Dependent Variable

INDEPENDENT VARIABLE	**Odds Ratio**	***p****	**Lower Bound**	**Upper Bound**
Male vs female	1.86	<.001	1.490	2.300
Ethnicity				
White vs Latino	1.81	<.001	1.418	2.310
White vs Asian American	0.58	.01	0.382	0.873
Physical activity recommendations met	1.04	.08		
Screen time recommendations met	1.20	.27		
Breakfast consumption	0.73	.006	0.588	0.910
Family meals	0.90	.33		
Age, years	1.86	<.001	1.490	2.320
12-13 vs 14-15	0.76	.02	0.599	0.650
12-13 vs 16-17	0.79	.06		
Adult education	0.76	<.001	0.669	0.855
<High school vs high school/diploma	0.87	.37		
<High school vs some college	0.63	.02	0.423	0.937
<High school vs college or higher	0.42	<.001	0.309	0.548
% of federal poverty level	0.80	<.001	0.716	0.889
0-99 vs ≥300	1.32	.11		
100-199 vs ≥300	1.69	<.001	1.300	2.200
200-299 vs ≥300	1.89	.001	1.300	2.760

***The *p* values in red are significant at *p* < .05.**

Table 7: Descriptive Data for Parents and Adolescents

		% of respondents					
Variable	**Overall Weighted Percent (N = 3006)**	**White Females% (n = 999)**	**White Males (n = 1001)**	**Latina Females (n = 335)**	**Latino Males (n = 352)**	**Asian Females (n = 133)**	**Asian Males (n = 186)**
Adult Physical Activity, minutes/week							
≤150	91.2	88.8	88.1	93.7	93.5	94.0	95.7
>150	8.8	11.2	11.9	6.3	6.5	6.0	4.3
Household Income, % of federal poverty level							
0-99	13.3	4.7	3.1	26.6	27.6	12.0	11.8
100-199	21.2	10.9	11.1	35.5	33.0	16.5	15.6
200-299	13.2	14.0	11.5	10.7	13.4	14.3	10.8
≥300	52.4	70.4	74.3	27.2	26.1	57.1	61.8
Parents' Educational Level							
<High school	23.7	4.0	2.5	48.1	44.0	8.3	5.9
High school diploma	24.6	21.7	18.2	23.3	21.6	17.3	18.8
Some college	14.9	21.4	17.9	10.4	114.5	9.8	9.7
College degree or higher	36.8	52.9	61.4	18.2	19.9	64.7	65.6
Adults' Years Lived in United States							
<1	0.3	0.0	0.1	0.3	0.9	0.8	1.1
2-4	2.1	0.1	0.3	2.1	3.1	5.3	6.5
5-9	3.8	0.5	0.8	6.3	6.5	13.5	8.6
10-14	5.3	1.0	0.6	9.6	9.7	6.8	10.8
≥15	32.1	8.3	6.5	53.7	48.3	54.1	56.5
Born in United States	56.4	90.1	91.7	28.1	31.5	19.5	16.7
Adults' Body Mass Index							
Underweight, 0-18.49	0.9	1.3	1.4	0.0	1.1	4.5	2.7
Normal weight, 18.5-24.99	34.1	42.5	43.9	29.6	25.9	60.2	62.4
Overweight, 25-29.99	38.8	34.1	36	38.8	44.0	28.6	29.0
Obese, ≥30.0	20.9	22.0	18.8	31.6	29.0	6.8	5.9
Teens' Physical Activity, days/week							
≥3	74.1	74.6	81.8	66.9	77.3	60.2	64.0
<3	25.9	25.4	18.2	33.1	22.7	39.8	36.0
Screen time, hours/day							
<2	20.9	22.9	17.9	19.1	21.0	17.3	8.1
≥2	79.1	77.1	82.1	80.9	79.0	82.7	91.9
Gender							
Males	49.7						
Females	50.3						
Age, years							
12-13	35.3	28.4	32.2	37.6	42.0	39.8	30.6
14-15	34	36.0	35.3	34.0	34.9	31.6	38.2
16-17	30.7	35.5	32.6	28.4	23.0	28.6	31.2
Ethnicity							
White	66.0						
Latino	23.0						
Asian	11.0						
Teens' General Health Status							
Poor	0.3	0.4	0.2	0.9	0.6	0.0	0.5
Fair	11.5	7.1	6.1	17.9	12.5	5.3	9.7
Good	33.6	27.8	29.4	36.1	42.0	33.8	33.3
Very good	35.4	44.7	42.5	28.7	28.1	36.8	36.6
Excellent	19.2	19.9	21.9	16.4	16.8	24.1	19.9
Teens' Body Mass Index							
<85th percentile	70.6	81.3	74.1	66.9	57.4	95.5	71.0
≥85th percentile	29.4	18.7	25.9	33.1	42.6	4.5	29.0

Table 8 Chi Square/Crosstabs

	% of Respondents		
Independent Variable	**<3 Days of Physical Activity**	**≥3 Days of Physical Activity**	**Statistics**
Gender			$\chi^2(1) = 21.951$, $p = .002$
Males	22.2	77.8	
Females	29.6	70.4	
Ethnicity			$\chi^2(1.931) = 41.60$, $p < .001$
White	21.4	78.6	
Latino	29.5	70.5	
Asian	35.9	64.1	
General Health			$\chi^2(3.493) = 67.54$, $p < .001$
Poor	27.2	72.8	
Fair	41.7	58.3	
Good	28.4	71.6	
Very good	21.0	79.0	
Excellent	21.4	78.6	
Age, years			$\chi^2(1.986) = 44.67$, $p < .001$
12-13	21.6	78.4	
14-15	23.3	76.7	
16-17	33.9	66.1	
Adults' Educational Level			$\chi^2(2.\ 08) = 55.86$, $p < .001$
<High school	36.4	63.6	
High school/diploma	22.7	77.3	
Some college	25.1	74.9	
≥College degree	21.6	78.4	
Adults' Years Living in United States			$\chi^2(4.68) = 55.10$, $p <.001$
Born in United States	21.4	78.6	
<1	37.7	62.3	
2-4	37.7	62.3	
5-9	30.5	69.5	
10-14	42.8	57.2	
≥15	29.6	70.4	
Parents' Body Mass Index			$\chi^2(2.81) = 5.86$, $p = .39$
Underweight	15.4	84.6	
Normal weight	26.2	73.8	

Overweight	24.6	75.4	
Obese	28.4	71.6	
Adults' Physical Activity, minutes/week			$\chi^2(1) = 4.84$, $p = .12$
>150	20.3	79.7	
≤150	26.5	73.5	
Teens' Screen Time, hours/day			$\chi^2(1) = 19.58$, $p = .004$
<2	19.1	80.9	
≥2	27.7	72.3	
Household Income, % of federal poverty level			$\chi^2(2.63) = 8.51$, $p = .16$
0-99	18.0	82.0	
100-199	40.5	59.5	
200-299	50.8	49.2	
≥300	29.3	70.7	

Table 9: Univariate Logistic Regression

Variable	Odds Ratio	*p*	95% Confidence Interval
Household Income, % of federal poverty level			
0-99 vs ≥300	1.95*	<.001	1.34-2.85
100-199 vs ≥300	2.11*	<.001	1.55-2.87
200-299 vs ≥300	1.61*	.02	1.07-2.40
Adults' Physical Activity	1.32*	.12	
Adults' Educational Level			
<High school vs college +	2.10*	<.001	1.50-2.89
High school/diploma vs college +	1.07*	.68	
Some college vs college +	1.20	.24	
Adults' Years Living in United States			
10-14 vs 15+	1.80*	<.001	1.00-3.16
Adults' Body Mass Index		NS	
Age, years			
12-13 vs 16-17	1.86	<.001	1.37-2.54
14-15 vs 16-17	1.69	<.001	1.26-2.26
Gender			
Males vs females	1.52	.001	1.18-1.94
General Health of Teen			
Poor vs excellent	1.37*	.65	
Fair vs excellent	2.62*	<.001	1.64-4.20
Good vs excellent	1.45*	.04	1.02-2.07
Very good vs excellent	1.03	.88	
Ethnicity			
Latino vs White	1.28	NS	
Asian vs White	2.44*	.004	1.35-4.42

Abbreviation: NS, not significant.

*Odds ratio inverted for interpretation.

Table 10: Multiple Logistic Regression

Variable	**Odds Ratio**	**95% Confidence Interval**	**Wald *F***	***df***	***p***
Screen time, hours			10.42	1	.003
>2 vs <2	1.71*	1.20-2.44			<.05
Gender			9.96	1	.002
Males vs females	1.49	1.16-1.90			<.05
Age, years			8.82	2	<.001
12-13 vs 16-17	0.55	1.33-2.49			<.05
14-15 vs 16-17	0.58	1.27-2.31			<.05
Ethnicity			6.80	2	.001
Latino vs White	1.14	0.76-1.69			NS
Asian vs White	1.93*	1.24-2.99			<.05
Household Income, % of federal poverty level			3.19	3	.02*
0-99 vs ≥300	0.74	0.44-1.24			NS
100-199 vs ≥300	1.76*	1.22-2.50			<.05
200-299 vs ≥300	0.76	0.52-1.11			NS
Teens' General Health			3.03	4	.02
Poor vs excellent	1.01	0.23-4.3			NS
Fair vs excellent	1.90*	1.18-3.23			<.05
Good vs excellent	9.79	0.55-1.13			NS
Very good vs excellent	1.08	0.77-1.52			NS
Adults' Educational Level			1.52	3	.21
<High school vs college +	0.65	-0.88-0.01			.06
High school vs college +	1.05	-0.28-0.37			.78
Some college vs college +	0.87	-0.47-0.19			.40
Years Living in United States			0.85	5	.51
<1 vs 15+	0.99	-0.39-0.37			.97
2-4 vs 15+	0.82	-1.77-1.38			.81
5-9 vs 15+	0.90	-1.10-0.90			.84
10-14 vs 15+	1.05	-0.58-0.67			.89
Born in United States vs 15+	0.56	-1.15-0.002			.049
Adults' Physical Activity, minutes/week			0.98	1	.12
<150 vs >150	1.25	-0.22-7.67			.32
Parents' Body Mass Index			1.02	3	.38
Underweight vs obese	2.10	-0.40-1.84			.21
Normal weight vs obese	0.92	-0.42-0.25			.62
Overweight vs obese	1.10	-0.27-0.43			.67

Table 11: Multiple Logistic Regression by Gender and Race

	Variable	Odds Ratio	95% Confidence Interval	*p*	Wald *F*	*df*	*p*
White Females (n = 999)	**Screen time, hours**				9.77	1	.002
	>2 vs <2	2.25*	1.35-3.74	<.05			
	Household Income,% of federal poverty level				4.30	3	.005
	100-199 vs ≥300	3.24*	1.70-6.17	<.05			
	General Health				2.99	4	.02
	Fair vs excellent	3.80*	1.61-8.77	<.05			
	Adults' Physical Activity, minutes/week				8.05	1	.005
	>150 vs < 150	2.94*	1.39-6.20	<.05			
White Males (n = 1001)	**Household Income, % of federal poverty level**						
	0-99 vs ≥300	4.60*	1.61-13.16	<.05			
	100-199 vs ≥300	2.30*	1.22-4.37	<.05			
	General Health Status						
	Poor vs excellent	22.70*	1.58-333.30	<.05			
	Fair vs excellent	3.80*	1.56-9.26	<.05			
	Age, years						
	14-15 vs 16-17 yrs	1.72	1.03-2.86	<.05			
Latina Females (n = 335)	**Age, years**				5.50	2	.005
	12-13 vs 16-17	3.94	1.74-8.89	<.05			
	Years Living in United States**				90.00	5	<.001
	Adults' Educational Level						
	<High school vs college +	3.0*	1.03-8.77	<.05			
	High school vs college +	3.0*	1.04-8.85	<.05			
Latino Males (n = 352)	**Parents' Body Mass Index**				240.93	3	<.001
	Underweight vs obese†	2.36E10	3.67E9-1523E11	<.001			
	Screen Time, hours				5.18	1	.02
	≥2 vs <2	3.16*	1.17-8.56	<.05			
	Adults' Educational Level						
	<High school vs college +	3.65*	1.15-11.63	<.05			
Asian Females (n = 133)†	SCREEN TIME, HOURS				6.18	1	.01
	≥2 vs <2	6.60*	1.46-0.68	<.05			
	General Health				3.73	3	.01

	Fair vs excellent	5.75	1.97-16.82	<.05			
	Good vs excellent	5.00	1.52-23.55	<.05			
	Years Living in United States				182.93	5	<.001
	1 vs 15+	2.34E10	4.59E-9-1.19E-11	<.05			
	Parents' Body Mass Index						
	Overweight vs obese	6.16	1.40-27.12	<.05			

Asian Males (n = 186)†	**Parents' Body Mass Index**				233.09	3	<.001
	Underweight vs obese	2.83E9	2.51E8-3.20E10	<.05			
	Household Income**				3.59	3	.02
	General Health				98.78	4	<.001
	Poor vs excellent	1.27E9	1.19E-10-1.34E-8	<.05			
	Age, years				5.23	2	.006
	12-13 vs 16-17	7.23	2.17-24.12	<.05			
	14-15 vs 16-17	3.49	1.08-11.26	<.05			
	Adults' Educational Level				3.67	3	.01
	High school vs college +	4.58	1.12-18.74	<.05			
	Years Living in United States (Adult)				53.69	5	<.001
	1 vs 15+	2.89E9	1.77E8-4703E10	<.05			

* Odds ratio inverted for easier explanation
**Overall significant but not categorically.
†Large odds ratio and standard error are due to the small sample size for Asian Americans and the small sample size for underweight Latinos.

Table 12
Demographics of Study Participants by Gender and Race for Body Dissatisfaction

	% of Participants					
	Girls (55.3%)			Boys (44.7%)		
Characteristic	**White (n = 639)**	**Latina (n = 280)**	**Asian (n = 80)**	**White (n = 473)**	**Latino (n = 249)**	**Asian (n = 86)**
Age, years						
12-13 (33.3 %)	24	36.5	30	31	42	37
14-15 (35.4%)	37	31	42	31	37	33
16-17 (31.3%)	39	32	28	38	21	30
Screen time (computer, television), hours/day						
<2 (19.7%)	20	16	11	15	27	7
≥2 (80.3%)	80	84	89	85	71	93
Physical activity (mean, 60 minutes daily), days/week						
≥3 (75%)	75	68	55	84	75	57
<3 (25%)	25	32	45	16	25	43
Body mass index, percentile						
≤85th (62%)	76	59	94	57	46	54
>85th (38%)	24	41	6	43	54	46
Body mass index (descriptive)						
Underweight: <5th percentile (1%)	2	0	0.2	2	3	0
Normal: 5th to <85th percentile (61%)	74	59	94	55	43	54
Overweight: 85th to <95th percentile (19.5%)	16	20	5	25	21	19
Obese: ≥95th percentile (18.5%)	8	21	0.7	18	34	27
General health status						
Poor (0.4%)	0.3	0.7	0.0	0.3	0.7	0.5
Fair (14%)	7	26	2	12	17	19
Good (36%)	30	37	42	35	44	33
Very good (33%)	41	22	40	40	25	36
Excellent (15%)	21	14	16	13	14	11
Body satisfaction						
Yes (77%)	79	72	74	83	75	71
No (23%)	21	28	26	17	25	29

Table 13
Cross Tabs Based on Body Dissatisfaction

	Dependent Variable[a]		
Independent Variable	**Satisfied With Body**	**Not Satisfied With Body**	**Statistics**
Gender			$F(1, 78) = 0.68$, $p = .40$
Male	78 (2), 74-82	22 (2), 18-26)	
Female	76 (2), 72-79	24 (2), 21-28	
Ethnicity			$F(1.94, 151.30) = 2.55$, $p = .08$
White	81 (2), 77-84	19 (2), 16-23	
Latino	73 (3), 66-79	27 (3), 21-34	
Asian	73 (6), 61-82	27 (6),18-39	
Age, years			$F(2, 155.91) = 0.34$, $p = .71$
12-13	76 (2), 71-80)	24 (2), 20-29)	
14-15	78 (2), 73-83	22 (2), 17-27)	
16-17	77 (3), 18-29	23(3), 18-29	
Physical activity			$F (1, 78) = .16$, $p = .69$
Meets standard (>3 days/week)	77 (1), 74-80	23 (1), 20-26	
Does not meet standard	76 (3), 70-81	24 (3), 19-30	
Screen time			$F(1, 78) = .01$, $p = .91$
Meets standard (<2 hours/day)	77 (3), 69-83	23 (3), 17-31	
Does not meet standard	77 (2), 74-80	23 (1.5), 20-26	
General health status*			$F(3.37, 263.16) = 5.90$, $p < .01$
Poor	85 (10), 53-97	15 (10), 3-47	
Fair	64 (5), 54-73	36 (4), 27-46	
Good	74 (2),.69-79	26 (2),21-31	
Very good	81 (2), 77-85	19 (2), 15-23	
Excellent	84 (3), 77-90	16 (3), 10-23	
Body mass index*			$F(1, 78) = 50.39$, $p < .001$
< 85th percentile	85 (1), 83-88	.63 (3), 57-69	
≥85th percentile	15 (1), 12-17	37 (3), 31-43	

[a]Values are percentage of respondents, standard error of percentage in parentheses, and 95% confidence interval.
*statistically significant

Table 14
Ordered Multiple Logistic Regression Summary by Gender and Ethnicity for Body Dissatisfaction

Group	Significant Factors	Odds Ratio	SE	*t*	*p*	95% *CI*
White girls (n = 639)	Overall significant: *F*(5, 74) 15.46, *p* <.01					
	Body mass index	2.59	0.35	6.94	<.01	1.97-3.39
	General health	1.29	0.10	-2.06	.04	0.60-0.99
Latina girls (n = 280)	Overall significant *F* (5, 74) = 8.38, *p* < .01					
	Body mass index	2.82	0.67	4.34	<.01	1.75-4.53
	General health	1.64	0.09	-3.29	<.01	0.45-0.82
Asian girls (n = 80)	Overall significant *F* (5, 74) = 5.07, *p* < .01					
	Body mass index	28.30	34.37	2.75	<.01	2.50-317.40
	Physical activity	5.59	3.10	3.11	<.01	1.86-16.84
White boys (n = 473)	Overall significant *F*(5, 74) = 8.46, *p* <.01					
	Body mass index	2.57	0.44	5.52	<.01	1.83-3.60
	General health	1.59	0.09	-3.32	<.01	0.47-0.83
Latino boys (n = 249)	Overall significant *F* (5, 74) = 2.47, *p* = .04					
	Body mass index	1.78	0.29	3.52	<.01	1.28-2.46
Asian boys (n = 86)	Overall significant *F* (5, 74) = 3.06, *p* = .01					
	Body mass index	4.95	2.22	3.55	<.01	2.02-12.10
	Screen time (close)	8.26	8.90	1.95	.05	

Red type indicates significant findings p < .05

Table 15 Summary of variables selected and significance (X = statistically significant for predicting outcome variable)

Variables red X represents significant Variable.	**BMI**	**Physical Activity**	**Body Dissatisfaction**
Microsystem (individual)			
Age	**X**	**X**	**X**
Gender	**X**	**X**	**X**
BMI	**OUTCOME**	**X**	**X**
Breakfast Consumption	**X**		
General Health Status		**X**	**X**
Physical Activity	**X**	**OUTCOME**	**X**
Sedentary Activity	**X**	**X**	**X**
Body Dissatisfaction			**OUTCOME**
Macrosystem (Family/Peers)			
Parent PA		**X**	
Parent BMI		**X**	
Parent Education Attainment	**X**	**X**	
Family Meals	**X**		
Mesosystem (Community)			
SES	**X**	**X**	
Ethnicity	**X**	**X**	**X**
Acculturation		**X**	

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6-8-09 — Date