Factors that Relate to Overweight and Obesity in Preschool Children: An Investigation of
Preschool Children in San Luis Obispo County

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By
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FACTORS THAT RELATE TO OVERWEIGHT AND OBESITY

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Abstract

Factors that relate to overweight and obesity in preschool children: An Investigation of Preschool Children in San Luis Obispo County

Kyla Tom

In the United States the trend towards overweight and obesity has been a major health concern as it has been linked to a variety of health problems. A nation-wide initiative, “Let’s Move” created by Michelle Obama was launched in February 2010 with the goal that, in one generation; every child born will be at a healthy weight at the start of adulthood. Healthy People 2020 are national health objectives for the United States to obtain by 2020. In 2009, San Luis Obispo (SLO) County preschool children overweight and obesity rates mirrored national rates of 1 in 5 four-year-old children were obese (Tom, Rivera, Ravalin, and Jankovitz, 2009).

The goal of this study was to assess the 2010 prevalence of overweight or ≥ 85th percentile (OW) and obesity or ≥ 95th percentile (OB) among preschool children in SLO County, compare the results to 2006 and to identify if there were associations to demographic, lifestyle and parental factors.

A total of 474 preschool children (4.54 ± 0.65 years) from 24 preschools participated in the physical assessments. A questionnaire was given to parents or guardians whose child completed the physical assessment to determine demographic, lifestyle and parental factors related to OW/OB (Head Start preschools did not participate in the questionnaire portion). There was a 50% response rate for the questionnaires.
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The results concluded that almost 1/3 of the preschool children were OW/OB, and about half of these children were OB. The Hispanic/Latino preschool children were twice as likely to be OW/OB as NW when compared to White children. Children attending a State preschool were 2.11 times more likely to be OW/OB versus NW than children attending a private preschool. Child health insurance plan, child birth weight, milk intake and parental BMI were found to be significant in effecting weight classification. When comparing 2006 to 2009/10, year, type of preschool and year (2006 or 2009/10) by ethnicity interaction were significant in determining weight class.

There was greater than a 30% increase in the prevalence of OW/OB in preschool children from 2006 to 2009/2010, suggesting that current programs and funding are not sufficient in reducing the OW/OB prevalence of preschool children in SLO County. Repeating this study every three years will provide information that could be helpful to the community, public health services, and the medical field in SLO County in the prevention of overweight, obesity and health complications that are related.
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Chapter 1

Introduction

Over the last 30 years, the trend toward overweight and obesity in the United States has led to a nation-wide epidemic. Overweight (OW) and obesity (OB) are major concerns as a threat to health among all age groups because they are linked to several co-morbidities including heart disease, diabetes, metabolic syndrome, and a variety of other health problems (Must, Spadano, Coakley, Field, Colditz, & Diez, 1999; Poirier, Giles, Bray, Hong, Stern, Pi-Sunyer, & Eckel, 2006). In response to the obesity epidemic, the First Lady, Michelle Obama, has made it a priority to combat this problem with a nation-wide initiative called “Let’s Move” which was launched on February 9th, 2010, and aims to prevent obesity in childhood. The ultimate goal is to focus on young children, so that in one generation, every child born after February 9th, 2010 will enter adulthood with a healthy weight (ABC News, 2010). Healthy People 2020 provides national health objectives from science-based evidence for the United States to obtain by the year 2020. Objectives related to prevention of childhood obesity include:

- Decreasing the proportion of children ages 2-5 who are overweight or obese (U.S. Department of Health & Human Services Healthy People 2020, 2009a).
- Decrease the intake of calories from solid fats and added sugars in the population 2 years and older (U.S. Department of Health & Human Services Healthy People 2020, 2009c).
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- Increase the number of children ages 2 years and older who watch television, view videos, play video games, play computer games or use a computer for other reasons than school for less than 2 hours per day (U.S. Department of Health & Human Services Healthy People 2020, 2009e).

Background

In the last 10 years the trend towards obesity in adults has leveled off, however, two thirds of the population remains overweight while half of the overweight are obese (Flegal, Carroll, Ogden, & Curtin, 2010). San Luis Obispo County’s (SLO) obesity rate of 21.3% (Centers for Disease Control and Prevention, b) is slightly lower than California’s rate of 1 in 4 adults being obese (Centers for Disease Control and Prevention, a). Preschoolers are no exception to rising obesity trends, as one in five four-year-olds in the United States is obese (Anderson & Whitaker, 2009). In 2009, the prevalence of overweight and obese preschool children in SLO County mirrored the national rates, but was almost a 29% increase from 2006 (Tom, Rivera, Ravalin, & Jankovitz, 2009).

Many demographic characteristics and behaviors have been linked to the trend towards overweight and obesity in preschool children. This includes factors such as ethnicity/race and socioeconomic status. American Indian/Native Alaskan persons had the highest prevalence of obesity, while White, non-Hispanic and Asian had the lowest. Hispanic and Black non-Hispanic were in between (Anderson & Whitaker, 2009). Socioeconomic status has shown to have an inverse relationship with obesity. In a study by Singh, Siahpush & Kogan (2010) the researchers found from the year 2003 to 2007 obesity prevalence increased 10% for US children aged 10-17 years, but for children in
low socioeconomic status, the increase was more than double. The odds for becoming obese were 3-4 times greater in low-income children than in children from higher income families.

Lifestyle factors, such as, television/screen viewing, physical activity, fast food/restaurant eating, sweetened beverage intake, sleep problems, and breakfast habits also have an impact on obesity in preschool children. The American Association of Pediatrics (AAP) recommends that media time be limited to 1-2 hours per day of quality programming for children 2 years and older (American Academy of Pediatrics, 2001). It has been found that many preschool children are watching more television than the recommended number of hours (Mendoza, Zimmerman & Christakis, 2007; Taveras, Hohman, Price, Gortmaker, & Sonneville, 2009). Television viewing has been linked to increases in energy intake (Miller, Taveras, Rifas-Shiman, & Gillman, 2008), and obesity (Miller, et al., 2008; Proctor, Moore, Gao, Cupples, Bradlee, Hood, & Ellison, 2003). In 2005, it was discovered that television viewing and physical activity predicted BMI in children ages 3 to 6 (Jago, Baranowski, Baranowski, Thompson, Greaves, 2005).

Along with screen time and physical activity, fast food has been linked to obesity. In a study of 9 to 14 year old children in the United States, it was found that children who consumed greater amounts of fried food away from the home weighed more. In the same study, the authors found that over a 1 year span, the children who increased their fried food away from home intake gained more weight than expected from normal growth (Taveras et al., 2005). Consumption of sugar sweetened beverages (SSB) has been found to increase obesity prevalence in preschool children (Welsh, Gogswell, Rogers, Rockett, Mei, & Grummer-Strawn, 2005; Lim, Zoellner, Lee, Burt, Sandretto, Sohn, Ismail,
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Lepowski, 2009). SSB are associated to decreases in milk consumption. It was hypothesized that the consumption of the SSB may be replacing the intake of milk (Keller, Kirzner, Pietrobelli, St-Onge, & Faith, 2009).

Not eating breakfast also influences weight status. In Canada, almost 1 tenth of preschool children did not eat breakfast. The amount of obese children was double among the children who did not eat breakfast compared to the children who consumed breakfast (Dubois, Girard, & Kent, 2005). Among African Americans aged 1-5 years, 7.4% skip breakfast and one fourth of the breakfast skippers were overweight (Williams, O’Neil, Keast, Cho, & Nicklas, 2008).

Children are highly influenced by adults in their lives. Parents are important because they teach their children life skills, habits and determine the environment and cultural norms. Parental factors of parental BMI and parental accuracy of their child’s weight status both influence OW and OB in preschool children. Parental BMI has been shown to be an independent risk factor of childhood overweight (Schaefer-Graf, Pawliczar, Passow, Hartmann, Rossi, Buhrer, Vetter, & Kordonouri, 2005). Parents also perceive their child to be at a healthier weight status than the child’s actual weight classification. For example, parents of overweight children were underestimating their child’s weight classification, thinking he/she was of normal weight (Hudson, Cherry, Ratcliffe, & McClellan, 2009). This is a problem because some parents know that being overweight is unhealthy, but they do not know how to determine whether their child is overweight (Small, Melnyk, Anderson-Gifford, & Hampl, 2009).

Just as in adults, children face diseases that are associated with obesity. In Australian preschool children, obese children were 72% more likely to have extra health
care needs than non-overweight children. Decrease in health related quality of life score was also associated with increases in weight status (Wake, Hardy, Sawyer, & Carlin, 2008).

Overweight and obesity is a problem that the nation and world face. It has been documented that overweight and obesity are related to other health issues. Demographic, lifestyle and parental factors have been recognized in other age populations, but there is a limited amount of information or there have been inconclusive relationships to overweight and obesity among preschool children. Finding associations to overweight and obesity can help in the prevention of unhealthy habits at a young age.

**Statement of Problem**

Overweight and obesity in SLO County preschool children is escalating. It is important to address the increasing rates and identify factors that can be changed to reverse the trend of overweight and obesity.

**Purpose of Study**

Prevalence of overweight and obesity have been studied in preschool children in SLO County, but there have been no studies looking at demographic and behavioral associations liked to obesity among this group. The purpose of this study was to assess the prevalence of overweight and obesity among preschool children in SLO County and to identify if correlations existed in relation to co-morbidities, ethnicity, socioeconomic status (SES), type of health insurance, parental education level, and birth weight, television/screen viewing and environment, physical activity, fast food/restaurant eating, sweetened beverage intake, breakfast habits, parental perception of their child’s weight status, and parental BMI.
Research Questions

This study was conducted to find the prevalence of obesity and factors that are associated with obesity. Research questions included:

- What is the prevalence of overweight and obese preschool children in SLO County?
- Is there a difference in overweight and obesity prevalence in preschool children among the 4 geographic regions in SLO County?
- Is there a positive relationship between overweight and obesity in preschool children and demographic characteristics of ethnicity/race, family income, type of health insurance, parental education level, and birth weight?
- Is there a positive relationship between overweight and obesity in preschool children and lifestyle factors of television/screen habits and home environment, physical activity, fast food/restaurant eating, beverage intake, and breakfast habits?
- Is there a positive relationship between overweight and obesity in preschool children and parental factors of parent accuracy of perception of their child’s weight status, parental BMI, and other conditions?

Hypotheses

- Overweight and obesity prevalence in preschool children will have a positive, significant relationship to geographic location.
- Overweight and obesity prevalence in preschool children will have a positive, significant relationship to demographic characteristics of ethnicity/race, family income, type of health insurance, parental education level, and birth weight.
Overweight and obesity prevalence in preschool children will have a positive, significant relationship to lifestyle factors of television/screen habits and home environment, physical activity, fast food/restaurant eating, beverage intake, and breakfast habits.

Overweight and obesity prevalence in preschool children will have a positive, significant relationship to parental factors of parent accuracy of perception of their child’s weight status, parental BMI, and other conditions.

The findings from this study could help the public health community identify areas for targeted interventions to help prevent and reverse the trend toward early onset obesity.

**Delimitations**

The sample was delimited to preschools from a self-selected population of public, private, California state schools, home child care facilities and Head Start schools after being invited to participate by the San Luis Obispo County Public Health Department. The preschools were recruited from attendees of a meeting of the Child Care Planning Counsel of SLO, a letter from a SLO County Public Health Department RD, a newsletter to home child care facilities, and by word of mouth. Pre-kindergarten schools were not able to participate. Preschools will be included if a date and time can be arranged for the physical assessments and date of birth was provided. From this group of preschools, the parents were self-selected to participate and have their child participate. Preschool children were included in the study if they had permission from a parent or guardian, attend preschool on the day of data collection, and if they wanted to participate. The
parent also had to be able to read and speak English or Spanish at a 6th grade reading level.

Limitations

1) Preschools were self-selected into the study and the study was not randomized.
2) Preschool parents also self-selected their children and themselves into the study and were not randomized. The results of the study cannot be generalized to the entire San Luis Obispo County population of preschool children.
3) The study was limited to Head Start, State and private preschools because the home childcare facilities did not want to participate. The researcher was not allowed to contact the home childcare facilities directly.
4) The Head Start preschool parents were unable to participate in the questionnaire. There was insufficient time to distribute questionnaires to parents, allow the parents to complete the questionnaire and return it to the preschool for collection before school ended for summer vacation.
5) Some preschools showed interest in participating, but were not able to because data collection was too close to the end of the school year.
6) Parents had to be able to read Spanish at a 6th grade reading level for the informed consent and questionnaire.
7) The study used a self-administered questionnaire to measure variables related to the prevalence of overweight and obesity. No direct observations were made.

Definitions

Beverages

Sweetened beverages- Includes 100% juice and juice drinks.
Juice drinks- Any drink that is not 100% juice and has sugar added.

100% fruit juice- Any drink that has a label that states 100% juice or fresh squeezed juice. This includes juice from concentrate.

Ethnicity/race- Modified from the Census 2010. There are 9 different ethnicities/race defined in this study: African American, American Indian, Asian, Pacific Islander, non-Hispanic White, Mexican (including Mexican American or Chicano), Puerto Rican, Cuban, and other.

Geographic Locations of SLO County

North Coast- This area includes Morro Bay and Los Osos.

North County- This area includes Atascadero, Paso Robles, San Miguel, and Templeton.

SLO/Central- This area includes San Luis Obispo city.

South County- This area includes Arroyo Grande and Pismo Beach.

Health Insurance

Federal poverty level- Federal poverty level until March 31, 2010 is $22,050 annually and $1,838 monthly income for a family of 4.

Health insurance through parent’s employer- Health insurance provided through a parent’s employer.

Private medical insurance- Non-public health insurance not provided through parent’s employer.

Medi-Cal- For children aged 1-5 years, the family income must be < 133% of the federal poverty level (e.g. a family of 4 cannot make a yearly income of > $29,327 or a monthly income of > $2,444).
Healthy Families- Health insurance for children < 19 years who come from a family with income of < 250% federal poverty level (e.g. a family of 4 cannot make a yearly income of > $55,125 or a monthly income of > $4,594) as of May 1, 2009. They must be residents of CA, citizens or meet immigration eligibility requirements, and not have insurance from a parent’s employer in the past 3 month.

Healthy Kids- Insurance for children < 19 years of age who are transferring from Medi-Cal to Healthy Families.

Preschools

Head Start- A national program to help preschool aged children prepare for school. Income eligibility requirement is < 130% of the federal poverty level (e.g. a family of 4 cannot make an annual income of > $28,665).

California State Preschool- State funded preschool programs administered by local educational, community-action and nonprofit agencies. The income eligibility requirements as of February 1, 2009 are < 225% of the federal poverty income (e.g. a family of 4 cannot make a yearly income of > $49,620).

Private Preschool- Preschools that are not government funded.

Preschooler- Children aged 3-5 enrolled in a certified preschool program.

Physical Activity- Any activity that increases heart rate and, some of the time, makes breathing hard.

Television/screen time- Amount of time spent in front of a screen. This can include television, video games on the television (e.g. Wii, Xbox and PlayStation) videos
watched in a television, computer screens, hand held video games (e.g. Gameboy and PSP), and portable televisions or DVD players.

Weight classification for adults aged 20+ years

Body Mass Index (BMI)- Ratio between weight and height. BMI is calculated by dividing weight in kg by height in m$^2$ (kg/m$^2$).

Underweight- BMI < 18.5 kg/m$^2$

Normal weight- BMI between 18.5 – 24.9 kg/m$^2$

Overweight- BMI between 25.0 – 29.9 kg/m$^2$

Obese- BMI > 30.0 kg/m$^2$

Obese class I- BMI between 30.0 – 34.9 kg/m$^2$

Obese class II- BMI between 35.0 – 39.9 kg/m$^2$

Obese class III- BMI ≥ 40 kg/m$^2$

Weight classification for children aged 2-19 years

2000 CDC Growth Charts for BMI-for-age- Created from national data from children aged 1-19 years and used to classify weight status as a percentile according to BMI, age and sex.

Underweight- Children < 5th percentile for BMI for age and sex according to the 2000 CDC Growth Charts.

Normal Weight- Children between ≥ 5th percentile and < 85th percentile for age and sex according to the 2000 CDC Growth Charts.

Overweight- Children ≥ 85th percentile for BMI for age and sex according to the 2000 CDC Growth Charts.
Obese- Children $\geq 95^{\text{th}}$ percentile for BMI for age and sex according to the 2000 CDC Growth Charts
Chapter 2

Literature Review

Overview

Overweight and obesity are important health issues that face this nation. Obesity is an important health concern because its association to other diseases such as heart disease, diabetes, and metabolic syndrome (Must, Spadano, Coakley, Field, Colditz, & Dietz, 1999; Poirier et al., 2006). Prevalence rates have shown that two-thirds of adult Americans are overweight or obese (Flegal, Carroll, Ogden, and Curtin, 2010) and one out of five preschool children is obese (Anderson et al., 2009). There are many factors that could be contributing to overweight and obesity in preschool children. A review of the relevant literature will focus on the effort to understand the increasing prevalence of overweight and obesity in preschool children and the need to reverse this trend. The first section will discuss the prevalence of overweight and obesity among adults and preschool children. It will also explore the co-morbidities that are associated with overweight and obesity. The second section of the literature review will focus on the following demographics factors that influence overweight and obesity in preschool children: Ethnicity, socioeconomic status (SES), type of health insurance, parental education level, and birth weight. The third section will examine lifestyle factors, including television/screen viewing and home environment, physical activity, fast food/restaurant eating, sweetened beverage intake, and breakfast habits. The fourth section will investigate parental influences, including, parental perception of their child’s weight status, and parental BMI.

Prevalence of Overweight and Obesity
In the United States, overweight and obesity in the adult population has been steadily on the rise from the year 1976-2000. The definition for overweight in adults is having a BMI between 25.0 – 29.9 kg/m² and obesity in adults is a BMI of ≥ 30 kg/m² (American College of Sports Medicine, 2006). In 2010, Flegal et al., discovered that the national trend of overweight and obesity in (data from the NHANES study, 1999-2008) American adults 20 years and older has leveled in women and possibly in men, but there is still an overweight rate of 68%. People of different ethnic backgrounds are at even greater risk for being overweight or obese. Age adjusted obesity in men was 32.3% (31.9% in non-Hispanic white, 35.9% in Mexican Americans and 37.3% in non-Hispanic black), and in women the rate was 35.5% (33.0% in non-Hispanic white, 45.1% in Mexican Americans and 49.6% in non-Hispanic black). More than being a social stigma, obesity has many emerging health concerns as it is associated with many co-morbidities. Must et al., (1999) analyzed data taken from the NHANES III (1988-1994) study, and found that diseases such as hypertension (doctor diagnosed or > 140 mmHg systolic or > 90 diastolic on mean of 3 blood pressure readings), Type 2 diabetes (self reported doctor diagnosed), gallbladder disease (doctor diagnosed) and osteoarthritis (doctor diagnosed) have been shown to increase as weight class increases.

Imitating the trend of adult overweight and obesity, the trend of American childhood overweight and obesity steadily increased between 1980 and 2004. According to NHANES 2003-2004 (n = 3858) and 2005-2006 (n = 4207) data on children aged 2-19 years, the prevalence rates of overweight was 30.1% and obesity was 15.5%, but the increasing trend of high BMI was not seen (Ogden et al., 2008). Another major health study, the National Survey of Children’s Health, (n = 45,190 in 2003 and n = 41,793 in
2007) children aged 10-17 prevalence rates showed an increase of 10.4% from 2003 to 2007, in that 16.4% were obese and 31.6% were overweight in 2007 (Singh, Siahpush, & Kogan, 2010).

Among the preschool population, Anderson and Whitaker (2009) discovered that 4 year old children (n = 8580) enrolled in the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) from 2005, 18.4% were ≥ 95th percentile. Identical rates are seen in Mississippi Head Start centers (Harbaugh, Bounds, Kolbo, Molaison, & Zhang, 2009) with an overweight prevalence rate of 38.5% and an obese rate of 20.6%. In urban preschool children participating the Fragile Families and Child Well-being Study (n = 2454, mean age of 38.6 months) 18.4% were obese and 35.6% were overweight. It is unclear if the prevalence rates for children in the United States have leveled or are still on the rise, but it is observed that the rates are still high. In preschool children, research has consistently observed that one in five preschool children is obese, but more research in this area is needed.

**Co-morbidities.**

In adults, overweight and obesity are related to other diseases that affect a person’s health. Obesity related diseases are also being seen in children. Kobaissi, Weigensberg, Ball, Cruz, Shaibi, and Gorban (2004) studied 131 overweight Hispanic children (aged 8-13 years) who were at risk for type 2 diabetes. They found that acanthosis nigricans was positively associated with BMI (p < 0.01) and negatively associated with insulin sensitivity (p < 0.01). Just like the previous study, lower insulin sensitivity was seen in overweight children (n = 139, aged 6-10 years) with acanthosis nigricans, but after adjusting for body fat mass, there was no significance (Nguyen, Keil, Russell,
The researchers suggested that body fat may be a better indicator of hyperinsulinemia. Acanthosis nigricans was also more apparent in African Americans than in white children (p <0.001).

In Australia, data from preschool children (n = 4934, aged 4 – 5 years) participating the 2004 Longitudinal Study of Australian Children (LSAC) were analyzed to find an association of co-morbid diseases with overweight and obese children (Wake, Hardy, Sawyer, Carlin, 2008). Health-related quality of life scores decreased with the increase in weight status. Special health care needs were more prevalent among obese children than normal weight children. Overweight children had an increase in wheeze when compared to normal weight children. Another Australian study (Tai, Volkmer & Burton, 2009) looked at the correlation of asthma and obesity in children (average age of 4.4 ± 0.4 years). Obese children were associated with wheeze and asthma. In both these studies the International Obesity Task Force (IOTF) cutoffs for BMI for age and sex in overweight and obesity were used. Contrary to what the Australian studies found, Canadian researchers (To, Vydykhan, Dell, Tassoudj, & Harris, 2004) did not find an association between asthma and overweight in Canadian 4 to 11 year old children (n = 11,199). This study did not use objectively measured height and weight. Parents reported height, weight and if a doctor told them that their child had asthma. There is a need for more research in this area with direct measurements.

Demographic Associations to Obesity

Ethnicity.

The rates of preschool overweight and obesity is disproportionate among different ethnic groups in the United States. Ethnic minorities have seen an increase in overweight
and obesity higher than the white majority. Prevalence of obesity in 4 year old children was examined among five ethnicities across the United States in a 2009 cross sectional study (Anderson et al., 2009). American Indian/Native Alaskan had the highest prevalence of obesity (31.2%), Hispanic (22.0%) and non-Hispanic black (20.8%) followed, and non-Hispanic white (15.9%) and Asian (12.8%) had the lowest. In line with what Anderson et al. found, Whitaker et al., (2006) observed Hispanic children (25.8%) were significantly more obese than black or white children (p < 0.001). In a population of Mississippi Head Start preschoolers, Harbaugh et al., (2009) discovered significant differences (p = 0.01) in the overweight category between non-Hispanic black (18.8%) and non-Hispanic white (12.2%).

Ethnic disparity in the prevalence of obesity has been an obstacle that many health professionals encounter. In a majority of the studies, the non-Hispanic white population had the lowest prevalence of obesity. Non-Hispanic black children can have as high as 20.8% and Hispanics 25.8%. Disparities in the prevalence of overweight and obesity among ethnicity/race groups are also seen in health insurance coverage.

**Socioeconomic status.**

Knowing SES is important for public health policy and the effort to decrease childhood obesity. Data from the NHANES studies from 1971-2002 lack evidence of significant correlations of SES (determined by the poverty income ratio or the ratio of household income and that year’s Census Bureau poverty line for family size) and overweight in children (aged 2-9 years), but showed significance in adolescents (aged 10-18 years). In the NHANES 1999-2002, increased risk of overweight was not present in all low SES groups. There was also an inverse relationship of SES and overweight in white
children and not in black children and adolescents (Wang & Zhang, 2006). Whitaker and Orzol (2006) analyzed data from a 1998-2000 birth cohort, the Fragile Families and Child Well-being Study on 2454 urban preschool aged children (mean age of 38.6 months) and discovered there was no relationship between obesity and household income.

Disparities in social status have affected childhood obesity rates. According to the 2003 and 2007 National Survey of Children’s Health, the prevalence of obesity increased 23-33% for children from homes of low-income and low-education, and overweight prevalence increased 13-25% (Singh et al., 2010). In 2003 data from the Medical Expenditure Panel Survey (MEPS) Household Component on 3775 children (aged 6-11 years) and adolescents (aged 12-17 years) was analyzed. Poverty (< 125% federal poverty level) was the highest in Blacks (41.7% in children and 39.6% in adolescents) and lowest in Whites. Uninsured rates among Latinos (19.7% in children and 27.1% in adolescents) was double than the other races. Having parents in poverty or less education (≤ 12 years) had higher rates of overweight, but type of insurance had no effect.

Looking at area-based socioeconomic factors within California Assembly districts, Drewnowski, Rehm, Kao and Goldstein (2009) found being under the poverty level was significantly related to overweight. Higher prevalence of overweight was in the Central Valley and central Los Angeles, where the poverty level is greater than in areas like the San Francisco Bay area and Orange County.

It is hard to determine the relationship between SES and overweight and obesity in the preschool population because there is no one definition of SES. Some studies have found significant correlations to overweight and obesity in childhood (Drewnowski et al.,...
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2009; Singh et al., 2010) and others have not (Wang et al., 2006; Whitaker et al., 2006). Along with SES, ethnicity has demonstrated associations with overweight and obesity.

**Health insurance status.**

In 2006, the prevalence rate of uninsured children and adolescents (< 19 years of age) in California was 13.5% and in San Luis Obispo County the number is slightly higher at 15.2% (U.S. Census Bureau). As indicated in the analysis of the Medical Expenditure Panel Survey (MEPS) Household Component data, uninsured rates among Latinos (19.7% in children and 27.1% in adolescents) was double than the other races (black, white, Asian/Pacific Islander). In a study with data from the 1996 Medical Expenditure Panel Survey (MEPS) Household Component (Haas et al., 2003), health insurance was found to not have an effect on high rates of obesity in children aged 6-11 years, but in adolescents aged 12-17 years not having insurance or having public insurance was related to obesity. Welch et al. (2008) looked at obese 1-4 year old children and found there was a significant association between being severely obese (≥ 160% ideal body weight, using the McLaren method) and being uninsured or having Medicaid as compared to having private insurance (p = 0.004). The McLaren is a three step process: 1) find age at which the child would be at the 50th percentile for height-for-age; 2) find 50th percentile weight for that age (ideal weight); and 3) divide actual weight by ideal to compute % of ideal body weight.

The proportion of uninsured children and adolescents is higher in San Luis Obispo County when compared to the State average (U.S. Census Bureau). Currently, there is an insufficient amount of information to draw conclusions about the relationship between health insurance coverage and obesity in children. Clearly, there needs to be
more research to see if there is a relationship between childhood obesity and being uninsured.

**Parental education level.**

Parental education has been positively associated with overweight and obesity rates. Singh et al. (2010) detected an increase of 23-33% prevalence of obesity in children (10-17 years of age) from homes of low-education (< 12 years), and an overweight prevalence increase of 13-25%. Haas et al., also found similar conclusions of children (6-11 years old) having parents with less education (≤ 12 years) had higher rates of overweight. In preschool children (n = 364, aged 2-5 years), increased maternal education was correlated with decrease risk of obesity (Kersey et al., 2005). Parental education was also related to the amount of television viewed by children. Children with parents with more education (some college or more) watched the least amount of television (Proctor et al., 2003).

**Birth weight.**

In 2005 German researchers (Schaeffer-Graf, et al.) found that in children born to mothers with gestational diabetes mellitus (GDM) BMI at birth was significantly correlated to BMI at a 6 year follow up (p < 0.001). Thirty-seven percent of the children born overweight remained overweight (≥ 90th percentile) at follow up compared with 25.4% of the normal birth BMI becoming overweight at follow up (p < 0.05). Similar to German children, children (average age of 6 years) of Mexican descent living in San Diego, CA had a significant relationship of birth weight and overweight (p = 0.02). In obese children attending a referral clinic, 71% of the severely obese (≥ 160% ideal body weight) children had a birth weight ≥ 4 kg. In contrast, only 44% had a birth weight < 4
kg (p = 0.019) (Welch et al., 2008). A significant association was also found in birth weight and BMI (p = 0.001) in 2-5 year old preschool children (Burdette, Whitaker, Hall, & Daniels, 2006).

There are many social and environmental factors besides birth weight that influence obesity. Television and screen viewing is one factor that has become more common.

**Lifestyle Factors**

**Television/screen viewing and home environment.**

Past research has shown possible negative effects of television viewing for children. In light of this problem, the American Academy of Pediatrics Committee on Public Education (2001) published a paper on recommendations for pediatrician and health care professionals on children’s television viewing. The AAP’s recommendations for pediatricians to tell parents are:

- Limit media time to less than 1-2 hours per day of quality programming.
- No televisions in children’s bedrooms.
- Monitor television shows children are watching.
- Parents should watch television shows with their children and discuss the content of the show.

In 2008, (Jordan & Robinson) an expert panel was created to tackle the issue of children, television and weight status. Their recommendations to reduce the amount of television viewed by children, to help decrease overweight and obesity rates, were the same as the APP recommendations (APP, 2001), but included turning off the television while eating. Despite the APP recommendations for children to watch less than 2 hours
of television per day, 68.3% of 3 year old children (n = 1016) watch > 2 hours of television per day (Lumeng, Rahnama, Appugliese, Kaciroti, & Bradley, 2006).

Higher educated (college or university education) Canadian parents (n = 71) also estimated that their preschool child (aged 2.5-5 years) watched between 1 and 5 hours of television per day (He, Irwin, Bouck, Tucker, & Pollett, 2005). A possible reason that the rates of watching > 2 hours of television is so high is that parents, in general, do not worry about their preschooler’s screen viewing (television, video, and computer use) behavior. Parents in the same study (He, 2005) also perceived screen viewing as educational and a good “babysitter.”

Television viewing time is associated with overweight and obesity. In a cross-sectional study (Jackson et al., 2009) of 89 children (aged 2-6 years; 42 boys and 47 girls) a positive correlation between time watching television and body fatness (DXA scans) existed (p < 0.004). Television time explained 46.9% of variation in body fat. An increase of 1 kg of body fat was related to 1 hour increase in watching television. Associations of television and overweight and obesity is also further supported in longitudinal data.

In 2005, Jago, Baranowski, Baranowski, Thompson, and Greaves used 1986-1989 data from the Studies of Child Activity and Nutrition (SCAN) Program in Texas to explore if physical activity, television viewing, other sedentary behaviors and diet predict body mass index in preschool children (26% Hispanic, 37% Anglo-American and 37% African American) over 3 years. Height and weight were directly measured to calculate BMI and trained research assistants observed television viewing (minutes watching television). In year 2 and 3, television viewing was significantly negatively associated with minutes of physical activity (year 2 and 3, p < 0.05). Across the 3 years there was a
main effect for television viewing ($p < 0.001$) and television viewing predicted BMI after the 3 years. Children (born in 1991, n = 1016) and parents participating in the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (10 urban and rural US cities) were analyzed for the relationship between obesity and television exposure at 36 and 54 months. Children who watched > 2 hours of television per day were more likely to be obese that children who watched < 2 hours ($p = 0.004$), but did not predict the new onset of obesity at 54 months (Lumeng, Rahnama, Appugliese, Kaciroti, & Bradley, 2006).

Longitudinal data from the Framingham Children’s Study (FCS) was used to find the association of time spent watching television during childhood and changes in body fat from preschools to adolescents (Proctor et al., 2003). The study started in 1987 with 106 children (aged 3-5) and their parents and the children were followed into adolescents (average age 11.1 years). BMI and skinfolds were the highest in adolescents that viewed the most television (average 2.4 hours of television per day) throughout childhood and the lowest in those who watch the least (average 1 hour per day) amount of television. The children who were sedentary and were in the high category for television watching gained the most fat. Overweight and obesity related to television viewing could be influenced by diet.

In a study by Miller, et al. (2008), researchers examined if there was an association between television and video viewing with diet quality in preschool children (mean age 3.2 years) selected from a large cohort in Massachusetts, Project Via, between April 1999 and July 2002. The results of this cross sectional study showed that the average hours of television viewing was 1.7 hours and consumed 1633 kcal/day
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There was a positive correlation between television viewing and poor diet. The more television that was watched, the more calories, fat and sugar were consumed.

Eating while in front of the television is a possible factor in the association of television to overweight and obesity. In a population of 3rd grader students (n = 90) in northern California (Matheson, Killen, Wang, Varaday, & Robinson, 2004) 73.6% ate while watching television, a significant association (p = 0.04) between BMI and percent of fat from calories consumed and on weekdays more than 25% of daily calories were consumed in front of the television.

Another factor in the link between television viewing and overweight and obesity is having a television in the child’s bedroom. Among low-income preschool children enrolled in New York State Women, Infants and Children (WIC) programs (n = 2761). More black (51%) and Hispanic (50%) children had a television in their bedroom than white (20%) children. These children spent, on average, 4.6 hours more watching television (p < 0.0001) and had a higher prevalence of overweight (p <0.001) than children who did not have televisions in their bedroom (Dennison, Erb & Jenkins, 2002). More children (67%) were found to have televisions in their bedroom in 2009 study (Taveras, Hohman, Price, Gortmaker, & Sonneville) of 200 children, aged 2-13 years. The same observation was found with blacks and Hispanics being more likely to have televisions in the bedroom than whites and television in the room increasing the amount of television viewed.

The correlation of overweight and obesity has been revealed, but in 1999 (Robinson) a study explored the direct link of changing TV habits to overweight and
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obesity. An intervention based on Bandura’s Social Cognitive Theory was taught to 3rd and 4th graders. Compared with the control (no intervention) the intervention group significantly decreased (p = 0.002) all measurements of adiposity (BMI, triceps skin folds, waist circumference, and waist-to-hip ratio). Children in the intervention group also decreased the hours watching television (p < 0.001) and eating meals in front of the television (p = 0.01) compared to the control group.

It is alarming that more than 2/3 of the preschool population is watching more than the APP recommended < 2 hours of television per day (Burdette & Whitaker, 2005; Lumeng et al., 2006) because the association with overweight and obesity (Jackson et al., 2009; Jago et al., 2005; Proctor et al., 2003). Television tends to be a sedentary activity and could possibly have effects on the physical activity of children.

**Physical activity.**

Physical activity is important to the health of children. Evidence has pointed to the association of level of physical activity and overweight and obesity. Jago et al. (2005) observed that physical activity (> 140 bpm/h was considered moderate to vigorous physical activity, measured with a heart rate monitor) predicted BMI in 6 year old children after 3 years. Across the 3 years there was a main effect for physical activity (p = 0.003) and BMI (p < 0.001). In a study (Trost, Sirad, Dowda, Pfeifffer, & Pate, 2003) to report direct observation of physical activity (research assistant using a modified Children’s Activity Rating Scale [CARS]) and accelerometry among 245 South Carolina preschool children (aged 3-5 years). Non-overweight (< 85th percentile) boys were had significantly higher scores in the observational activity variables and higher counts on the
accelerometer than overweight boys (≥ 85th percentile). There was no difference between non-overweight and overweight girls.

Physical activity is hard to compare among different studies because the methods for data collection are not the same. However, the trend of physical activity and overweight and obesity seem to correlate with one another. With directly measured physical activity, there was a significant relationship with overweight and obesity in preschool children. Being physically active is necessary to be healthy, as is eating balanced meals.

**Fast food/restaurant eating.**

Little research has been done on the association of fast food/restaurant eating and overweight and obesity among children. Even less has investigated this association in preschool children. On a usual day 30.3% of American children and adolescents (aged 4-19 years) reported eating fast food (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004). Data was analyzed from both the Continuing Survey of Food Intakes by Individuals (CSFII) 1994 to 1996 and the 1998 Supplemental Children’s Survey. Among the children and adolescents aged 9-19 the total energy intake per day was greater among the fast food consumers when compared to the non-consumers (p < 0.05). There was no significance difference among the 4-8 year olds. The children and adolescents who ate fast food consumed 187 kcal on average per day more than participants who did not eat fast food. Within the participants who ate fast food, 126 more kcal were consumed on days that fast food was eaten than on days with no fast food. This calculated to a 6 pound per year increase from extra kcal consumption.
Ding & Parks (2007) used data from a nationally represented population of 15,686 adolescents (ages 10-15 years) in the United States from the Health Behavior of School-Aged Children (HBSC) survey. Fast food was considered eating potato chips, French fries or fried potatoes, hamburgers, hot dogs, and sausages anywhere. The low consumption group ate fast food once a week, but not daily and the high consumption group ate fast food at least once a day. Height and weight were self reported and then computed for weight status using the 2000 CDC growth charts. The high fast food consumption group members were 1.23 times as likely to report being overweight than the low consumption group members. Factors that could influence the eating of fast food were having at least one parent with no high school education (1.45 times as likely compared to college educated parents), being African American (2.67 times as likely compared to being White) and being male (1.68 times as likely compared to being female).

Research with adolescents suggests that fast food consumption can increase the tendency for overweight and obesity but there is still a need for more information. There also needs to be research done with preschool children in this area. Unlike fast food/restaurant eating, sweetened beverages have been studied more in depth and are linked to the prevalence of overweight and obesity in children.

**Sweetened beverage intake.**

The AAP recommends that toddlers between the ages 1 and 6 years should only consume 4-6 oz of fruit juice per day. O’Connor, Yang & Nicklas (2006) observed that 2-5 year old children (n = 1160) from the NHANES 1999-2002 consumed 100% fruit juice, fruit drinks and soda within the AAP recommendations, but it is unclear the total
consumption of all three beverages was within the recommendations. Weight status was not related to consumption of total amount of milk, type of milk, 100% juice, fruit drinks and soda. However, other studies have found a correlation between sugar sweetened beverages (SSB) and weight status.

A longitudinal study of 365 African American children ranging from 3-5 years old was conducted from a 2 year long cohort study (Detroit Dental Health Project) in a Detroit, Michigan dental clinic (Lim et al., 2009). From baseline to follow-up the overweight prevalence increased 5.8% from 12.9% to 18.7% and obesity went from 10.3% to 20.4%. The chances of becoming overweight from baseline to follow-up increased by 4% for every one ounce of fruit drink or of all sugar-sweetened drinks consumed per day. Through the use of data from the Harvard Service Food Frequency Questionnaire in the larger study for the Missouri Pediatric Nutrition Surveillance System (PedNSS) and the Missouri Demonstration Project 10,904 children (ages 2-3 years old) were analyzed (Welsh et al., 2005). Of the children in the 85th-94th percentile, 25% were ≥ 95th percentile in the follow up and the children ≥ 95th percentile at base line, 67% remained in this category. The average number of sweet drinks consumed per day was 2.9. The children who consumed 1 – ≥3 sweet drinks per day were more likely to remain in the ≥ 95th percentile category and the children in the 85th-94th percentile were more likely to move into the ≥ 95th percentile. Drinking even 1-2 sweet drinks can increase the chance of becoming obese or remaining obese. In 1-5 year old children attending a New York WIC program, juice intake increase was correlated with increases in adiposity (p < 0.01) (Faith, Dennison, Edmonds, & Stratton, 2006). When looking at 100% juice, mixed conclusions were found about the association with overweight and obesity.
Information from the NHANES 1999 – 2002 data (Nicklas, O’Neil & Kleinman, 2008) on children 2 – 11 years old (n = 3618) revealed that not consuming 100% juice significantly increased the amount of fruit drinks (p < 0.001) and soft drinks (p < 0.001). There was no significant difference in the weight status for the amount of 100% juice consumed. According to Welch, et al. (2008) there was a significant difference in severe obesity with different amounts of juice consumed daily (p = 0.037). Besides 100% juices, children drink SSB.

The timing of when the SSB are consumed could also be a factor in the association between SSB and overweight and obesity. In Canada, researchers (Dubois, Farmer, Girard, & Peterson, 2007) examined the association between SSB (any beverage with sugar added, not including 100% fruit juices) consumed between meals and obesity prevalence in children (n = 1,499) from the age 2.5 to 4.5 years (year 2000 to 2002). A 24-hour dietary recall and food frequency questionnaire (FFQ) were used to collect data on nutrition. When the children were 4.5 years of age there was a significant association between consuming SSB daily and obesity. Children who did consume sweetened beverages between meals regularly (15%) (4 – 6 times per week) between 2.5 and 4.5 years old had a prevalence rate twice that of children who did not consume (7%). Another negative health consequence of the consumption of SSB is its displacement of the consumption of milk.

In a cross sectional study (Keller, Kirzner, Pietrobelli, St-Onge, & Faith, 2009) conducted from November 1999 to September 2002 with same sex twins (mean age of 4.5 ± 1.5 years), the children ate lunch with their mothers in a laboratory setting to explore the genetic and environmental effect on eating behavior. It was observed that the
consumption of sweetened beverages (cola, juice, and juice drink) had a negative relationship with the intake of milk ($p = 0.02$) and both chocolate and white milk ($p < 0.01$). Boys were significantly more likely to consume milk than girls ($p = 0.01$) and Hispanic children consumed more milk than non-Hispanic white children ($p = 0.02$) (Faith et al., 2006).

Consuming sweetened beverages can increase the risk for overweight and obesity in preschool children. It is well demonstrated in the literature that parents are not following the AAP recommendation and allowing their children to consume more that the recommended daily allowances. Sweetened beverages are a negative factor in a child’s weight status. Infant feeding practices, such as breastfeeding duration and timing of introducing complementary food is also important in the prevention of overweight and obesity in preschool children.

**Breakfast habits.**

Few studies have examined the breakfast habits of preschool children and overweight and obesity. In Canada 9.8% of 4.5 year old children do not eat breakfast every day (Dubois, Girard & Kent, 2005). In the same study of 1520 children from the Quebec Longitudinal Study of Child Development (1998-2002) (QLSCD) parents completed a standardized questionnaire about breakfast habits and a 24-hour food recall. A total of 8.8% of the children were obese. Children who did not consume breakfast every day were twice as likely to be obese than the children who ate breakfast every day. In another Canadian study using the same data from the QLSCD (Dubois, Girard, Kent, Farmer, Tatone-Tokuda, 2008) the researchers tried to explain possible reasons why there is a relationship between breakfast eating and overweight and obesity. They found that
children who skipped breakfast consumed less energy and macronutrients meals, but consumed more from snacks, leading to the assumption that the children are making up for the lack of energy consumed at breakfast in later consumption of food.

Among 521 African American children (aged 1-5 years) in the NHANES 1999-2002 cohort 7.4% skipped breakfast, 45.0% ate ready-to-eat cereals (RTEC), 47.6% ate other breakfasts foods other than RTEC. Children who consumed breakfast (RTEC and other) (13.1%) had lower rates of overweight than children who skipped breakfast (26.1%). Children who ate RTEC had lower mean BMI than children who skipped breakfast or ate other breakfast foods (p ≤ 0.05). German researchers (Toschke, Thorsteinsdottir, von Kries, 2009) used data from the 2004/2005 Bavarian school entry health examination (n = 4,642 five to six year old children) to study meal frequency and childhood obesity. Obese was defined as by the BMI for age and sex criteria defined by the International Obesity Task Force. They found that eating more meals in a day had a significant negative association with obesity, but regular breakfast consumption was not a factor in the association.

Many lifestyle factors are shown to correlate with overweight and obesity, but parental influences are also important factors in the overweight and obesity rates in preschool children.

Parental Factors

Parental accuracy of perception of their child’s weight status.

Parental perception of their child’s weight status is important in the fight against childhood obesity. Surprisingly for studies in this area, focus groups were the method of collecting data, for example; in 2001, Jain et al., studied 18 low-income Cincinnati, Ohio
mothers’ perceptions of when a child was deemed overweight, why children become overweight and barriers that prevent managing overweight children. Twelve of the
mothers’ weight status was ≥ 30 kg/m². All but one child had a BMI ≥ 85 percentile and 7 were in the ≥ 95 percentile. The obese mothers were able to accurately depict their
weight status and most agreed that being overweight was a problem. Only 10 of the 15
overweight mothers acknowledged that her preschool child was overweight, but only 2 worried about the weight status. The mothers would become worried about weight if their
child stopped physical activity or were teased by other children. They also thought that
obesity cause children to become inactive. The mothers did not like the 2000 CDC
growth charts and felt that it did not pertain to their child. The authors found a
disconnection between how health professionals view obesity as compared to these low-
income mothers.

A study (Small et al., 2009) to see the relationship of overweight and health and
its meaning to Mexican parents of preschool children was organized with 11 parents of
preschool children. The parents knew that being overweight was unhealthy and that there
was a difference in health from being larger because of fat rather than muscle. The
parents wanted to know if their child was at a healthy weight, but did not know how to
tell. Hudson et al., (2009) found a significant association between Alabama Head Start
parent’s (n = 96) perceptions of weight class and actual BMI in healthy weight versus
overweight and obese children (p < 0.001). Majority (90.7%) of parents of obese children
misclassified their child as average weight (Hamack et al., 2009). It was also discovered
that about 46% classified their child in the wrong category and the same percentage
thought their child was in a lower weight class.
This inability for parents to accurately assess their child’s weight status is not limited to the United States. Australian mothers were able to accurately evaluate their weight status, but only 4.1% could accurately assess their preschool child’s (mean age of 4.4 years) weight classification.

Studies have shown that parents do not categorize their child’s weight classification properly and tend to underestimate (Hamack et al., 2009). Once a parent is able to recognize their child’s weight status, interventions can be implemented to help the child to a healthier weight. Not only is parental perception important in childhood overweight and obesity, but parental BMI is a strong indicator of childhood BMI.

**Parental BMI.**

Maternal BMI is a significant predictor of overweight children, average age of 6 years (p = 0.001) in Latino mothers residing in San Diego, CA (Villa-Caballero, Arredondo, Campbell, & Elder, 2009). In a study by Welch et al. (2008), differences in a mother’s weight class are significantly associated to severe obesity (≥ 160% ideal body weight) in children (p = 0.02). The rate of severe obesity in children with obese mothers was 64% compared to 33% in overweight and 43% in mothers with a BMI < 25 kg/m². Maternal BMI was a significant predictor of childhood overweight (p = 0.001).

To further the research on parental BMI and its link to children’s BMI, Wrotniak, Epstein, Paluch, & Roemmich (2004) followed the influence of parental BMI change to the child’s BMI change at the beginning and end of a family-based weight control program. Parental BMI change significantly predicted the child’s BMI in the first 6 months (p < 0.001) and at 24 months (p = 0.009).
More evidence came from a German study in 2005 (Schaefer-Graf et al.) that supported the notion that parental BMI is linked to childhood BMI (≥ 90th percentile is defined as overweight). Children (n = 324) of mothers with GDM were measured at birth and at a follow up (average 5.5 years later). At follow up maternal and paternal BMI was correlated to the child’s BMI (p < 0.001 and p = 0.003, respectively). With having one parent obese, the rate of overweight in the child was 34.1% (up from 20.4% for children with both parents < 30 kg/m$^2$). This rate increased to 69.2% when both parents were obese (p < 0.001).

Research has revealed the significant correlations of parental BMI and children’s BMI (Villa-Caballero et al., 2009; Wrotiak et al., 2004; Schaefer-Graf et al., 2005). It is unclear if this relationship is genetic, environmental or a combination of both. Parental BMI many be a factor in childhood overweight and obesity, however, overweight and obesity are associated with multiple childhood diseases.

**Conclusion**

With childhood overweight and obesity rates higher than in previous years, it is important to identify the factors that are associated with overweight and obesity in order to reverse this trend. This study will expand what is known about overweight and obesity in preschool aged children by assessing demographic, lifestyle and other factors related to overweight and obesity. Some variables associated with overweight and obesity in older children are access to health care or health insurance, parental education, fast food/restaurant eating, and sleeping problems, but there is a limited amount of research about the preschool aged population. This study will assess these factors in preschool children across San Luis Obispo Count. Learning more about the multiple factors that
influence childhood overweight and obesity will help the public health community determine how to provide and implement programs best suited for the preschool aged population.
Chapter 3

Methods

The aim of this study was to determine current prevalence of overweight and obesity, the prevalence increase over time, and identify factors associated with overweight and obesity among preschool children in San Luis Obispo County. Identifying these factors could help to identify intervention strategies to decrease the prevalence of overweight and obesity.

Subjects

Participants (n = 474) were male and female children with an average age of 4.54 ± 0.65 years, preschool in San Luis Obispo County. In the spring of 2006 (n = 579) and 2009 (n = 508) preschool children participated in the physical assessments only. In 2010, children from twenty-four preschools (4 Head Start preschools, 5 state preschools, and 15 private preschools) participated in the study. Four hundred and seventy-four preschool children participated in the physical assessments and 216 parents or guardians (35.20 ± 7.32 years) returned the questionnaire during the months of May and June, 2010.

Recruitment

Preschool Recruitment.

Preschools eligible to participate were private, public state schools, Head Start schools and home child care centers. The lead researcher and a registered dietician (RD) from the Maternal, Child, and Adolescent Health Program of San Luis Obispo County Public Health Department attended a meeting of the Child Care Planning Counsel (CCPC) of San Luis Obispo to recruit preschool directors to volunteer their school sites to participate in the study. Present at that meeting were directors of preschools and other
professionals working with preschools and child care centers. Interested parties provided contact information so they could be contacted and receive additional information about participating in the study. Preschools not represented at the CCPC meeting were sent a letter from the Public Health Department’s RD that provided a brief description of the study to be conducted and inviting them to participate. A copy of the letter is in Appendix A. Recipients of the letter were part of the CCPC and had participated in obesity prevalence studies conducted by the San Luis Obispo County Public Health Department on preschool children in the past. The RD provided the lead researcher a list of the preschools contacted by letter. If a preschool director did not respond to the letter within 1-2 weeks, the lead researcher followed-up with email and/or phone call to the preschool director.

Home child care facilities were recruited by way of the Community Action Partnership (CAP) of San Luis Obispo County newsletter. An advertisement was placed in the newsletter welcoming the center’s directors to contact the lead researcher if they would like to participate. A copy of the newsletter is in Appendix B.

Word of mouth was also used as a recruitment strategy. A preschool that wanted to participate and met the eligibility requirements was welcome to be part of the study. If a preschool was interested in participating, the lead researcher arranged a day and time to measure the children. The scheduling of physical assessments at the preschool was on a first-come-first served basis. The preschool that contacted the lead researcher first had first choice to select the date for data collection at their site. The preschool staff was also used to help recruit parents and their preschool child into participation of the study.
Preschool Child Recruitment.

In addition to fliers that were placed at the preschools, preschool teachers and directors helped to spread the word about the study. The purpose of the study and the benefits of participating were explained in the informed consent that was distributed to the parents prior to the physical assessments. The informed consent asked for permission to measure their child’s height and weight. If the parents gave consent, then their child was measured on the day of data collection.

Parent Recruitment.

On the day of the physical assessment at the preschool, each parent was given a copy of the questionnaire and a “Champions for Change” resources kit from the Network for a Healthy California as an incentive to fill out the questionnaire. The parents were asked to take the questionnaires home to complete and return to the preschool. Preschool teachers talked with the parents about the purpose and value of the study to peak interest and encouraged them to fill out the questionnaire.

Data Collection

Assessment Team.

Physical assessments included measures of height and weight. The protocol for height and weight was a modified version of the protocol used in the NHANES study. Height and weight measures were collected by undergraduate student research assistants who were currently enrolled in the Assessment Team (A-Team) class at California Polytechnic State University and were proficient in the use of standardized measurement protocols for height and weight. To be proficient, the A-Team member must have demonstrated his or her skills and proficiency to the lead researcher and be approved. All
members of the A-Team completed the National Institutes of Health’s Protection of Human Research Participants certification. These measurements were collected on site at the participating preschools.

**Height.**

Height was measured without shoes by the Seca 214 Portable Stadiometer. The stadiometer was calibrated with a measuring tape. The measuring tape started at the zero on the stadiometer and an A-Team member made sure that the numbers on the tape measurer matched the numbers on the stadiometer. The children were asked to remove any shoes and any hats or hair accessories that could alter their height measurement. They were directed to stand with their back facing the stadiometer, and to step as close as possible without touching the stadiometer. Next they were instructed to stand as tall as they can with keeping their feet flat on the ground, just like at the doctors office. The preschooler stood tall and still with feet together and arms by his or her side. The A-Team member lowered the head piece to the crown of the child’s head. The measurement was read and then the child was asked to step forward. This process was repeated two more times. Each child was measured three times to the nearest 0.1 cm. The data collectors recorded all three measurements. The lead researcher determined the two closest measurements within 0.3 cm and manually averaged the two during the data entry process. If there were no two measurements that are within 0.3 cm, all three measurements were averaged.

**Weight.**

Weight was measured without shoes and with light clothes by digital scale to the nearest 0.1 kg. The scales were calibrated at every site with a 5 lb weight and were
returned to zero after every measurement. Three measurements were taken. The data collectors recorded all three measurements. The lead researcher determined the two closest measurements within 0.1 kg and averaged the two. If there were no two measurements within 0.1 kg, all three measurements were averaged. Parents provided data of birth and ethnicity on the informed consent. Preschool teachers provided the sex of the children for all preschools and date of births and perceived ethnicity/race if the parents omitted it on the informed consent. The data record form can be found in Appendix C.

Weight Classification.

Weight classification was stratified into percentiles by sex using the 2000 Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts for children 2-20 years. CDC growth charts can be found in Appendix D. BMI is a ratio between height and weight and is calculated by dividing weight in kg by height$^2$ in m$^2$ (BMI = kg/m$^2$). Underweight was classified as $< 5^{th}$ percentile. Children $\geq 5^{th} - 84.9^{th}$ percentiles were considered normal weight. Overweight children were $\geq 85^{th}$ percentile and obese children were $\geq 95^{th}$ percentile.

Incentives

After conducting the physical assessments, children were given a sticker and parents were provided a copy of the results of their child’s height, weight, BMI percentile and weight classification. As a thank you and incentive gift, all parents received a “Champions for Change” resource kit from the Network for a Healthy California. The kits were available in English and Spanish versions and contain the following: a magnetic grocery list pad, flash cards with nutrition facts about different fruits and vegetables, a
guide to the recommended number of servings of fruits and vegetables that should be consumed, an informational brochure on physical activity and fruits and vegetables, and a cook book with healthy Latino recipes.

**Questionnaire**

If a child was measured, a questionnaire was given to his or her parents to be completed and returned. The questionnaire can be found in Appendix E. The questionnaire was composed of 44 items to gather information about demographic factors, lifestyle factors, and parental influences. Items about demographics included ethnicity/race, family income, health insurance status, level of parental education, and birth weight. Lifestyle factors included items about television/screen habits and home environment, physical activity, drink consumption, fast food/restaurant eating, and breakfast habits. The last section incorporated questions about parental influences such as parental perception of their child’s weight status, parental BMI, and co-morbidities. The items were taken from standardized questionnaires, including Dr. James Sallis’ “Active Where? Parent-Child Survey.” Some questions were derived and adapted from standardized questions of the 2009-2010 NHANES Survey Questionnaires. If standardized questions were not found, items were created. The questionnaire was provided in English and Spanish.

**Coding of the Data Recording Form and Questionnaire**

Before data collection began the preschool staff members were asked to provide each child’s name and date of birth to the lead researcher. Each child was assigned a specific 4-digit code to provide for confidentiality before the data were collected. Three labels were created; one with the child’s name and 4-digit code (used as a master copy),
and 2 labels with the 4-digit codes (one placed on the physical assessment data collection form and one on the parent questionnaire). After measuring height and weight at the preschools, questionnaires were left for the parents to take home and complete. The parent or guardian of every child who completed the physical assessment received a questionnaire. Before the physical assessments were done, preschool teachers were asked if any of the children were siblings or lived in the same household. For the children living in the same household, a note was placed on the outside of the questionnaire envelope instructing the parent to complete one questionnaire for each child that attends the preschool. An envelope with the child’s name on the outside and a questionnaire with the child’s four digit code number were placed inside the envelope. The parents were then instructed to complete the questionnaire and return it in the envelope to the preschool. After the researcher collected the envelopes, the questionnaires were taken out and the envelope discarded. From that point on, the questionnaire was not associated with a name, but with a 4-digit code.

**Collection System**

A box was left at the preschool for the parents to return the completed questionnaires. The preschool teachers were directed to keep all the questionnaires in the box. Two weeks after the physical assessments, the lead researcher collected the questionnaires from the participating preschool sites. The preschool teachers also called the lead researcher to pick up questionnaires if more were returned after the initial collection date.
2006 Study

Data from 2006 was provided by the San Luis Obispo County Department of Public Health. Preschool children (n = 579) from San Luis Obispo County were measured at different preschools. The children were between the ages of 3 and 5 years. All children were given permission by a parent to participate in the study. A team of three researchers led by the Registered Dietician at the SLO County Department of Public Health measured children’s height and weight on site at different preschools. Height was measured with a portable stadiometer and weight was measured with a digital scale. The same methods used to determine weight classification in 2010 were also used in 2006 (pg. 39-40).

2009 Study

The A-Team measured the height and weight of 508 preschool children (ages 3-5 years) from preschools around SLO County. The 2009 A-Team had the same training requirements as the 2010 A-Team (pg. 38). Height was measured with a portable stadiometer. The same calibration technique and protocols to measure height were used as the 2010 study (pg.38-39). In 2009 the same scale, calibration technique, and protocols were used to measure the preschool children’s weight as in 2010 (pg.39). The preschool teachers provided date of birth and sex. Perceived ethnicity was also recorded.

Data Analysis

Data was analyzed by statisticians from the California Polytechnic State University, San Luis Obispo, statistics department. An upper division undergraduate student analyzed the physical assessment data and part of the questionnaire data. A
professor of statistics analyzed the data from the questionnaire and the 2006 versus 2009/10 data.

**Physical assessments 2010.**

Summary tables were created for the demographic factors (sex, ethnicity, regional location, and type of preschool) collected during the physical assessments to see the distribution of preschool children within them. Summary tables were also used to find the distribution of NW, OW, OB, and a combination of OW and OB among the demographic factors. Odds Ratios were used to determine the probability of children being OW/OB compared to NW, OW compared to NW, and OB compared to NW. Confidence intervals were set at 95%. The odds ratios were considered significant if the 95% confidence interval did not contain 1.00.

**Questionnaire.**

To analyze the questionnaire data the OW and OB groups were combined because there were limited numbers of children in both groups. An ordinal logistic model was created and the Likelihood Ratio was used to test if any of the variables in the model significantly impacted the weight classification of the preschool children. A significant (p < 0.05) model meant there was at least one variable that affected the weight classification. The Wald Chi-Square test was used to observe if there was significance in the Likelihood Ratio. The Wald Chi-Square found the individual variables that affected the weight classification of the preschool children. Odds Ratios were also used to calculate the probability of the preschool children being in one weight class compared to another. Significant odds ratios were determined by the 95% confidence interval not containing 1.00.
2006 Data versus 2009/2010 Data

SAS/STAT (version 9.2 of the SAS system for Windows) was used to compare the data from 2006 and a combination of 2009 and 2010 (2009/2010). Due to many preschools participating in both the 2009 and 2010 studies, the data from each year were combined to reduce the risk of a child being counted twice in the analysis. Four and five year old children from 2009 were combined with three and four year old children from 2010. Chi-square analyses were conducted to test each variable, year, sex, ethnicity, and type of school against weight classification. Significance was set at $p < 0.05$. Logistic regression was used to create a model comparing UW/NW children to OW/OB. The OW and OB groups were combined due to a small sample size in both groups. The Hosmer-Lemeshow goodness-of-fit test was used against the model. Odds Ratios were also used to compare OW/OB children to UW/NW children among the variables, year, sex, ethnicity, and type of preschool.

Confidentiality

All information pertaining to the study was kept in a locked cabinet. Only the lead researcher and faculty advisor had access to this file. This study was approved by the Human Subjects Committee at California Polytechnic State University, San Luis Obispo, California and authorized by the San Luis Obispo County Public Health Department.
Chapter 4

Results

The first section of reported results examines the data collected from the physical assessments of the preschools in 2010. Height, weight, date of birth, ethnicity, sex, type of school, and geographic location were collected onsite at different preschools around SLO County. The second section reports the findings from the analysis of the data from the questionnaires returned by parents or guardians. The purpose was to identify associations between overweight and obesity in preschool children and demographic characteristics, lifestyle and parental factors. The third section reports comparisons in prevalence of overweight and obesity among preschool children in 2006 and 2009/2010.

Physical Assessment 2010

Descriptive Statistics.

In the Spring of 2010, four hundred and seventy four preschool-aged (4.54 ± 0.65 years) were measured for height and weight. Date of birth and ethnicity were also recorded. Ethnicity was categorized into 3 groups, White, Hispanic/Latino, and other. Participants attended preschools from all 4 regions of SLO County, North, South, Central/SLO, and North Coast. This study included private, Head Start, and California State preschools. The data for sex, ethnicity, area of the county and type of preschool are found in Table 1.
Table 1

_Descriptive statistics of preschool children in SLO County, 2010_

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>230</td>
<td>48.52</td>
</tr>
<tr>
<td>Female</td>
<td>244</td>
<td>51.48</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>196</td>
<td>41.35</td>
</tr>
<tr>
<td>White</td>
<td>226</td>
<td>47.68</td>
</tr>
<tr>
<td>Other</td>
<td>52</td>
<td>10.97</td>
</tr>
<tr>
<td><strong>Regional Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Coast</td>
<td>93</td>
<td>19.62</td>
</tr>
<tr>
<td>North County</td>
<td>147</td>
<td>31.01</td>
</tr>
<tr>
<td>SLO City</td>
<td>107</td>
<td>22.57</td>
</tr>
<tr>
<td>South County</td>
<td>127</td>
<td>26.80</td>
</tr>
<tr>
<td><strong>Type of Preschool</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Start</td>
<td>141</td>
<td>29.75</td>
</tr>
<tr>
<td>Private</td>
<td>237</td>
<td>50.00</td>
</tr>
<tr>
<td>State</td>
<td>96</td>
<td>20.25</td>
</tr>
</tbody>
</table>

Table 2 shows the prevalence of overweight and obese preschool children in SLO County. It reports the proportion of preschoolers categorized by three body weight.
classification; normal weight, overweight, obese and overweight/obese. There were no
underweight children measured in the year 2010. Table 2 also answers the research
question: What is the prevalence of overweight and obese preschool children in SLO
County? Approximately, one-third of the participants were overweight or obese.

Table 2

Distribution of Preschool Children among Weight Classification, 2010

<table>
<thead>
<tr>
<th>NW</th>
<th>OW</th>
<th>OB</th>
<th>OW/OB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>317 (66.88 %)</td>
<td>84 (17.72 %)</td>
<td>73 (15.4 %)</td>
<td>157 (33.12 %)</td>
<td>474 (100 %)</td>
</tr>
</tbody>
</table>

Table 3 further breaks down the distribution of the prevalence of OW and OB
preschool children by sex, ethnicity, regional location and type of school. Male and
females were similar in prevalence of OW/OB. The Hispanic/Latino population had a
higher rate of OW/OB than the White and Other population. North County had the
highest prevalence of OW/OB out of the 4 regions. Head Start preschools had the highest
rate of OB and a combination of OW/OB, but the Private preschools had the highest
prevalence of OW.
Table 3

*Descriptive Statistics Distributed by Weight Classification, 2010*

<table>
<thead>
<tr>
<th></th>
<th>NW</th>
<th>OW</th>
<th>OB</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>n = 474 (100%)</td>
<td>317 (66.88)</td>
<td>84 (17.72)</td>
<td>73 (15.40)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 230 (48.52%)</td>
<td>155 (67.39)</td>
<td>41 (17.83)</td>
<td>34 (14.78)</td>
<td>75 (32.61)</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 244 (51.48 %)</td>
<td>162 (66.40)</td>
<td>43 (16.59)</td>
<td>39 (16.00)</td>
<td>82 (33.60)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 223 (47.05 %)</td>
<td>167 (74.89)</td>
<td>37 (16.59)</td>
<td>21 (9.42)</td>
<td>58 (26.01)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 196 (41.35 %)</td>
<td>110 (56.12)</td>
<td>40 (20.41)</td>
<td>46 (23.47)</td>
<td>86 (43.88)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 51 (10.76 %)</td>
<td>39 (76.47)</td>
<td>7 (13.73)</td>
<td>6 (11.76)</td>
<td>13 (25.49)</td>
</tr>
<tr>
<td><strong>Region Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North County</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 147 (31.01 %)</td>
<td>91 (61.90)</td>
<td>27 (18.37)</td>
<td>29 (19.73)</td>
<td>56 (38.10)</td>
</tr>
<tr>
<td>South County</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82 (64.57)</td>
<td>26 (20.47)</td>
<td>19 (14.96)</td>
<td>45 (35.43)</td>
<td></td>
</tr>
</tbody>
</table>
n = 127 (26.79 %)

SLO/Central County

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>81 (75.70%)</td>
<td>16 (14.95%)</td>
<td>10 (9.35%)</td>
<td>26 (24.30%)</td>
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</tr>
</tbody>
</table>

North Coast

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63 (67.74%)</td>
<td>15 (16.13%)</td>
<td>15 (16.13%)</td>
<td>30 (32.26%)</td>
<td></td>
</tr>
</tbody>
</table>

**Type of Preschool**

Private

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>179 (75.53%)</td>
<td>34 (14.34%)</td>
<td>24 (10.13%)</td>
<td>58 (24.47%)</td>
<td></td>
</tr>
</tbody>
</table>

Head Start

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>81 (57.45%)</td>
<td>29 (20.57%)</td>
<td>31 (21.98%)</td>
<td>60 (42.55%)</td>
<td></td>
</tr>
</tbody>
</table>

State

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<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>57 (59.38%)</td>
<td>21 (21.88%)</td>
<td>18 (18.75%)</td>
<td>39 (40.63%)</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1

*Weight Classification Prevalence According to Sex, 2010*

![Graph showing weight classification prevalence by sex.](Image 108x745)

- Male: 230 (48.52%)
- Female: 244 (51.48%)
- Total: 474 (100%)

Figure 2

*Weight Classification Prevalence According to Ethnicity, 2010*

![Graph showing weight classification prevalence by ethnicity.](Image 108x395)

- White: 223 (47.05%)
- Hispanic/Latino: 196 (41.35%)
- Other: 51 (10.76%)
- Total: 474 (100%)
Figure 3

*Weight Classification Prevalence According to Regional Location, 2010*

![Graph showing weight classification prevalence according to regional location, 2010. Legend includes: North County n=147 (31.01%), South County n=127 (26.79%), SLO/Central County n=107 (22.57%), North Coast n=93 (19.62%), Total n=474 (100%).]

Figure 4

*Weight Classification Prevalence According to Type of Preschool, 2010*

![Graph showing weight classification prevalence according to type of preschool, 2010. Legend includes: Private n=237 (50.00%), Head Start n=141 (29.75%), State n=96 (20.25%), Total n=474 (100%).]
Odds ratios.

Odds ratios were calculated to determine the likelihood of being OW/OB given certain characteristics. Table 4 shows the odds ratios for sex, ethnicity/race, regional location and type of preschool. It also answers the research question: Is there a relationship between overweight and obesity in preschool children and ethnicity/race?

The Hispanic/Latino populations were found to have significantly higher odds of being in a heavier weight category than their White counterparts. The study supported the hypothesis that OW and OB were significantly related to ethnicity/race. The State preschools had significantly higher odds than Private preschools of being OW/OB than NW, however, the State preschools had a lower likelihood of being OW than NW. Head Start preschools were significantly at higher odds of being OW than /NW when compared to the Private preschools. The results rejected the hypothesis that OW and OB were significantly related to geographic location.
Table 4

*Odds Ratios and 95% Confidence Intervals of Preschool Children Being OW, OB and OW/OB*

<table>
<thead>
<tr>
<th></th>
<th>OR of being OW/OB vs. NW (95% CI)</th>
<th>OR of being OW vs. NW (95% CI)</th>
<th>OR of being OB vs. OW (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female vs. Male</td>
<td>1.05 (0.71, 1.53)</td>
<td>1.10 (0.55, 1.52)</td>
<td>1.00 (0.62, 1.61)</td>
</tr>
<tr>
<td><strong>Ethnicity/Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino vs.</td>
<td>2.26 * (1.48, 3.41)</td>
<td>1.65 * (1.00, 2.74)</td>
<td>2.03 * (1.02, 4.01)</td>
</tr>
<tr>
<td>White</td>
<td>(1.00, 2.74)</td>
<td>(1.00, 2.74)</td>
<td>(1.02, 4.01)</td>
</tr>
<tr>
<td>Other vs. White</td>
<td>1.04 (0.51, 2.06)</td>
<td>0.82 (0.34, 1.96)</td>
<td>1.51 (0.45, 5.09)</td>
</tr>
<tr>
<td><strong>Regional Location</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLO City vs. North</td>
<td>---</td>
<td>0.83 (0.38, 1.82)</td>
<td>0.63 (0.22, 1.82)</td>
</tr>
<tr>
<td>SLO City vs. South</td>
<td>---</td>
<td>0.62 (0.33, 1.32)</td>
<td>0.86 (0.23, 1.50)</td>
</tr>
<tr>
<td>North Coast vs.</td>
<td>---</td>
<td>0.80 (0.31, 1.25)</td>
<td>0.93 (0.32, 2.30)</td>
</tr>
</tbody>
</table>
FACTORS THAT RELATE TO OVERWEIGHT AND OBESITY

North County | (0.61, 2.53) | (0.38, 2.26)
---|---|---
North Coast vs. South County | 1.33 | 1.37
South County | --- | (0.40, 1.64) (0.54, 3.46)
North County vs. South County | 0.93 | 1.47
--- | --- | (0.51, 1.72) (0.67, 3.24)

**Type of Preschool**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Start vs. State</td>
<td>1.08</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>(0.64, 1.83)</td>
<td>(0.50, 1.87)</td>
</tr>
<tr>
<td>State vs. Private</td>
<td>2.11 *</td>
<td>0.52 *</td>
</tr>
<tr>
<td></td>
<td>(1.28, 3.49)</td>
<td>(0.28, 0.96)</td>
</tr>
<tr>
<td>Head Start vs. Private</td>
<td>1.88 *</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>(1.08, 3.30)</td>
<td>(0.73, 3.14)</td>
</tr>
</tbody>
</table>

*Significant (95% CI did not contain 1)

**Questionnaire 2010**

The total number of questionnaires returned was 216 out of 333 (64.86 % response rate), with NW = 157 (72.69 %) and OW/OB = 59 (27.31%). Parents from Head Start preschools (n = 141) were unable to participate in the questionnaire portion of the study due to the timing of summer break for the preschools. Mothers were the highest responders at 88.43% (n = 191), 10.18% (n = 22) were fathers, 0.93% (n = 2) were grandparents, and 0.46% (n = 1) were legal guardians.

Caution should be taken when examining the results of the questionnaire data because the sample size for the OW/OB group was small compared to the NW group.
The questionnaire data was matched to particular respondents that also completed the physical assessments.

**Descriptive statistics.**

The descriptive statistics for the questionnaire items can be found in Appendix G. Categories for the following items were collapsed due to insufficient response size; screen time, eating while watching TV, snacking while watching TV, watching TV in the car, fast food/restaurant eating, soda intake, sweetened beverage (includes 100% juice and juice drinks) intake, milk intake, and eating breakfast. For milk intake, parents who responded 0oz or none were excluded, so all responses were for children who drank cows’ milk. Parents who responded none to how many days per week their child eats breakfast were excluded because the response size was insufficient.

**Wald chi-square.**

For the analysis of the following questionnaire data, the Likelihood Ratio, an ordinal logistic model, was used to test variables in a model to see if any of them significantly impacted the weight classification of the preschool children. The Chi-Square was 46.11 with a p-value of 0.0008. With a p-value < 0.05, the Likelihood ratio showed that there is at least one variable that affected the weight classification of the preschool children. The Wald Chi-Square test was used to determine the individual variables that affected weight classification (Table 5). It also answers the following research questions:

- Is there a relationship between overweight and obesity in preschool children and demographic characteristics of family income, type of health insurance, parental education level, and birth weight?
• Is there a relationship between overweight and obesity in preschool children and parental factor of parental BMI?

The results supported the hypotheses that OW and OB were significantly related to child health insurance plan, child birth weight and parental BMI were all found to significantly affect weight classification.

Table 5

**Wald Chi-Square Values and P – Values for Possible Variables Affecting Weight Classification**

<table>
<thead>
<tr>
<th>Effect</th>
<th>DF</th>
<th>Wald Chi-Square</th>
<th>P – value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1</td>
<td>1.863</td>
<td>0.172</td>
</tr>
<tr>
<td>Family Income</td>
<td>4</td>
<td>5.734</td>
<td>0.220</td>
</tr>
<tr>
<td>Parental Ethnicity</td>
<td>2</td>
<td>2.060</td>
<td>0.357</td>
</tr>
<tr>
<td>Child Health Insurance Plan *</td>
<td>6</td>
<td>13.668</td>
<td>0.033</td>
</tr>
<tr>
<td>Parental Education level</td>
<td>4</td>
<td>4.454</td>
<td>0.348</td>
</tr>
<tr>
<td>Child Birth Weight *</td>
<td>1</td>
<td>5.648</td>
<td>0.018</td>
</tr>
<tr>
<td>Parental BMI *</td>
<td>1</td>
<td>8.046</td>
<td>0.005</td>
</tr>
<tr>
<td>Parental Age</td>
<td>1</td>
<td>2.307</td>
<td>0.129</td>
</tr>
</tbody>
</table>

* Significant (p < 0.05)

The Wald Chi-Square analysis and odds ratios were used to answer the following question: Is there a relationship between overweight and obesity in preschool children and lifestyle factors of television/screen habits and home environment, physical activity, fast food/restaurant eating, beverage intake, and breakfast habits? A model was created with 13 variables from the previous question, sex and race. A total of 163 parents (119 of
the children were NW and 44 OW/OB) responded to all the variables in the model. Table 6 shows the variables used in the model with the p-values.

Table 6

Wald Chi-Square p-values for Variables Used in the Model to Identify Predictors of OW/OB

<table>
<thead>
<tr>
<th>Variables</th>
<th>DF</th>
<th>Chi-Square p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1</td>
<td>0.202</td>
</tr>
<tr>
<td>Ethnicity/Race *</td>
<td>2</td>
<td>0.015</td>
</tr>
<tr>
<td>Soda Intake</td>
<td>2</td>
<td>0.877</td>
</tr>
<tr>
<td>Sweetened Drink Intake</td>
<td>2</td>
<td>0.899</td>
</tr>
<tr>
<td>Water Intake</td>
<td>2</td>
<td>0.263</td>
</tr>
<tr>
<td>Milk Intake *</td>
<td>2</td>
<td>0.016</td>
</tr>
<tr>
<td>Fast Food/Restaurant Eating</td>
<td>2</td>
<td>0.281</td>
</tr>
<tr>
<td>Eating Breakfast</td>
<td>2</td>
<td>0.507</td>
</tr>
<tr>
<td>Physical Activity Time</td>
<td>2</td>
<td>0.516</td>
</tr>
<tr>
<td>Number of TVs in Household</td>
<td>1</td>
<td>0.404</td>
</tr>
<tr>
<td>TV in Child’s Bedroom</td>
<td>1</td>
<td>0.725</td>
</tr>
<tr>
<td>TV/Screen Time</td>
<td>2</td>
<td>0.140</td>
</tr>
<tr>
<td>Eating While Watching TV</td>
<td>2</td>
<td>0.404</td>
</tr>
<tr>
<td>Snacking While Watching TV</td>
<td>2</td>
<td>0.595</td>
</tr>
<tr>
<td>Watching TV in the Car</td>
<td>2</td>
<td>0.559</td>
</tr>
</tbody>
</table>

*Significant (p < 0.05)
After controlling for all other variables in the model, ethnicity/race and milk intake were significantly related to weight classification. Table 7 shows the odds ratios for Ethnicity/race and milk intake. Controlling for all other variables in the model, the Hispanic/Latino population was 6.43 times more likely to be OW/OB than the White population. Children who drank a low amount of milk (< 6 oz/day) had a 3.19 times greater likelihood to be OW/OB than children who drank a medium amount of milk (6-12 oz/day).

Table 7

*Odds Ratios of Variables that are Significantly Associated with OW/OB*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio for OW/OB vs. NW</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity/Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino vs. White *</td>
<td>6.43</td>
<td>(1.82, 22.70)</td>
</tr>
<tr>
<td>Other vs. White</td>
<td>1.09</td>
<td>(0.26, 4.57)</td>
</tr>
<tr>
<td>Milk Intake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 12 oz) vs. Medium (6-12 oz)</td>
<td>0.59</td>
<td>(0.20, 1.70)</td>
</tr>
<tr>
<td>Low (&lt; 6 oz) vs. Medium (6-12 oz) *</td>
<td>3.19</td>
<td>(1.06, 9.59)</td>
</tr>
</tbody>
</table>

*Significant (95% CI does not contain 1)*

Backward selection was used to remove variables from the model that were not related to OW/OB. Variables with p-values < 0.05 are allowed to stay in the model. Sex
and race were kept in the model regardless of significance. Table 8 shows the model after backward selection. Table 9 shows the odds ratios for ethnicity/race.

Table 8

Model after Backward Selection

<table>
<thead>
<tr>
<th>Variable</th>
<th>Chi-Square p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>0.283</td>
</tr>
<tr>
<td>Ethnicity/Race</td>
<td>0.016 *</td>
</tr>
</tbody>
</table>

*Significant (p < 0.05)

Table 9

Odds Ratios of Ethnicity/Race after Backward Selection

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity/Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino vs. White *</td>
<td>2.97</td>
<td>(1.36, 6.48)</td>
</tr>
<tr>
<td>Other vs. White</td>
<td>0.88</td>
<td>(0.26, 2.94)</td>
</tr>
</tbody>
</table>

*Significant (95% CI does not contain 1)

The following analysis answers the research question: Is there a relationship between overweight and obesity as compared to normal weight children in preschool children and parental factors of parent accuracy of perception of their child’s weight status, parental BMI, and other conditions. The total number of responses was 172 (NW = 131 and OW/OB = 42) for the model. There was not enough data to fit a model in the other conditions. Parent accuracy of their perception of their child’s weight status was not associated with weight classification (p = 0.912).
When controlling for sex \((p = 0.306)\) and ethnicity/race \((p = 0.347)\) of the child; birth weight was associated with weight classification \((p = 0.042)\) and guardian BMI was associated with weight classification \((p = 0.002)\). After controlling for sex, ethnicity/race and birth weight, the estimated odds of being OW/OB was 1.124 (95% CI: 1.013, 1.211). The estimated odds of a child being OW/OB increased 12.4 % for every 1-unit increase in guardian BMI. The odds ratio for being OW/OB compared to normal weight was 1.480 (95% CI: 1.013, 1.958) for child’s birth weight, meaning that for each 1-lb increase in birth weight increased the estimated odds of being OW/OB by 40.8%.

**2006 Versus 2009/2010**

**Summary statistics and chi-square results.**

The summary statistics and chi-square tests for the physical assessment variables of year, sex, ethnicity, and type of school were divided into four categories (UW/NW, OW, OB, and OW/OB) and are available in table 7. Using a chi-square test, ethnicity was significantly associated to the distribution of children among weight classification. The analysis showed that ethnicity, year and type of preschool were also significantly related with weight.
Table 10

*Summary Statistics and Chi-Square Values of a Combination of 2006 and 2009/10 Data*

<table>
<thead>
<tr>
<th></th>
<th>UW/NW</th>
<th>OW</th>
<th>OB</th>
<th>OW/OB</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 1041)</td>
<td>69.1%</td>
<td>16.2%</td>
<td>14.7%</td>
<td>30.9%</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 (n = 236)</td>
<td>68.6%</td>
<td>17.2%</td>
<td>14.2%</td>
<td>31.4%</td>
<td></td>
</tr>
<tr>
<td>2009/10 (n = 271)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 (n = 246)</td>
<td>69.5%</td>
<td>15.4%</td>
<td>15.2%</td>
<td>30.6%</td>
<td></td>
</tr>
<tr>
<td>2009/10 (n = 288)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong> *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0009</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 (n = 217)</td>
<td>74.1%</td>
<td>15.2%</td>
<td>10.7%</td>
<td>25.9%</td>
<td></td>
</tr>
<tr>
<td>2009/10 (n = 270)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006 (n = 265)</td>
<td>64.6%</td>
<td>17.2%</td>
<td>18.2%</td>
<td>35.4%</td>
<td></td>
</tr>
<tr>
<td>2009/10 (n = 289)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year</strong> *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.007</td>
</tr>
<tr>
<td>2006 (n = 482)</td>
<td>73.7%</td>
<td>12.9%</td>
<td>13.5%</td>
<td>26.4%</td>
<td></td>
</tr>
<tr>
<td>2009/10 (n = 559)</td>
<td>62.1%</td>
<td>19.1%</td>
<td>15.7%</td>
<td>34.8%</td>
<td></td>
</tr>
</tbody>
</table>
Type of Preschool * 0.0005

<table>
<thead>
<tr>
<th>Type of Preschool</th>
<th>2006 (n = 128)</th>
<th>2009/10 (n = 146)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Start</td>
<td>61.3% 19.0% 19.7% 38.7%</td>
<td>61.3% 19.0% 19.7% 38.7%</td>
</tr>
<tr>
<td>2006 (n = 128)</td>
<td>68.1% 15.3% 16.6% 31.9%</td>
<td>68.1% 15.3% 16.6% 31.9%</td>
</tr>
<tr>
<td>State</td>
<td>75.6% 15.2% 9.2% 24.4%</td>
<td>75.6% 15.2% 9.2% 24.4%</td>
</tr>
<tr>
<td>Private</td>
<td>2006 (n = 148)</td>
<td>2009/10 (n = 233)</td>
</tr>
</tbody>
</table>

* Significant (p < 0.05)

Logistic regression.

A model was created from a logistic regression to compare UW/NW children to OW/OB children. The Hosmer-Lemeshow goodness-of-fit test was used and was not significant (p = 0.9995), meaning that the model was an excellent fit with the data. The model resulted in that type of preschool and year by ethnicity interaction were significant.

Odds ratios.

In 2006, there were no differences in weight classification between Hispanic and White preschool children (OR = 0.88, 95% CI = 0.55, 1.41), but in 2009/2010, Hispanic/Latino children had a 1.6 times greater likelihood of being OW/OB (95% CI = 1.04, 2.51). Head Start preschool children were 1.7 times more likely to be OW/OB than private preschool children (95% CI = 1.11, 2.62). Children attending state preschools had
no greater likelihood of being OW/OW than Head Start children (OR = 0.8, 95% CI = 0.93, 1.80) or private preschools (OR = 1.3, 95% CI = 0.87, 2.01).
Chapter 5

Discussion

A previous study (Tom, et al., 2009) on this population of SLO County preschool children has produced data on weight class, ethnicity, type of school and regional location, but there was no data on lifestyle or parental influences. The goal of the study was to find the prevalence of overweight and obesity among the San Luis Obispo County preschool population and to look for associations within demographic, lifestyle and parental factors.

When examining the finding, one should keep in mind the limitations. The study’s population was self-selected and not randomized, meaning the results could not be generalized to the population of preschool children in SLO County. Home childcare facilities did not participate. Head Start preschool parents did not participate in the questionnaire portion. Some preschools could not participate because summer break was too close to the study. Parents had to be able to read English or Spanish at a 6th grade reading level. The questionnaire was self-administered and no direct observations were made.

Main Findings

The main findings in this study were: 1) over 1 in 7 preschool children were OB; 2) just under 1/3 of the preschool children were overweight or obese; 3) the Hispanic/Latino population was over 2 times more likely to be OW/OB than the White population; 4) children attending CA State preschools were twice as likely to be OW/OB than preschoolers attending private preschools; 5) health insurance plan, child birth weight and parental BMI significantly influenced weight classification; 6) ethnicity and
race were significant predictors of OW/OB after controlling for other lifestyle predictors; 7) controlling for other lifestyle factors, children with low (< 6 oz/day) milk intake were 3.19 times more likely to be OW/OB than children with a medium (6-12 oz/day) milk intake; 8) the estimated odds of being OW/OB increased 12.4 % for each unit increase of parental BMI when controlling for sex, race, and birth weight; 9) after controlling for sex, race, and guardian BMI, for every 1 pound increase in birth weight the odds of being OW/OB increased by 40.8%; 10) year and type of preschool (examining both 2006 and 2009/10) were significantly associated with weight class; and 11) year by ethnicity interaction was related to weight class.

**Physical Assessments**

The current study found that just under 1/3 of the preschool children were OW/OB. The OB rate of 15.4% was lower than the 2005 national rate of four-year-old children (Anderson and Whitaker, 2009). While the OW/OB rate increased in a few years, it was still lower than preschool children in 2005 Mississippi Head Start programs (Harbaugh, et al., 2009) and a study of preschool children assessed from 20 large cities in the United States (Whitaker & Orzol, 2006). The Hispanic/Latino population had 119% more OB children than the White population. Other studies have found similar results (Whitaker & Orzol, 2006; Anderson & Whitaker, 2009; Ogden et al., 2008; Haas et al., 2003), just not to the magnitude of the current study. The North and South County regions had the most OW/OB preschool children, but there was no significant difference between all the regions. There were differences found among type of preschools, but there are no known studies that have looked at the weight classification differences among type of preschools.
Questionnaire

There was a good return rate of the questionnaire with more than 1 out of 2 parents responding. Birth weight and parental BMI were variables significantly related to weight classification, as with similar results found in other studies (Burdette et al., 2006; Schaefer-Graf et al., 2005; Villa-Caballero et al., 2009). Unlike the current study, Haas (2003) did not find any association of type of health insurance plan and weight classification.

Summary

It was hypothesized that overweight and obesity prevalence would be significantly related to demographic, lifestyle and parental factors. The results revealed that only health insurance plan, birth weight and parental BMI were significant in the weight classification of the preschool children. Year, type of preschool and year by ethnicity interaction also were significantly related to weight classification.

In summary, this study found that 1/7 of the preschool population was OB, 1/3 was OW/OB and the OW/OB rate increased significantly from 2006 to 2009/10. Health insurance plan, child birth weight, milk intake, parental BMI, year, type of preschool, and year by ethnicity interaction were significant determinants in weight classification. The population of the study was limited and the limitations could have affected the outcomes. With more research, new variables could emerge as having effects on overweight and obesity.

Future Research

In this current study the return rate for the questionnaire was over half of the population, but less than a quarter of the children whose parents responded were OW/OB.
The sample size was small and could be due to the inability of the Head Start programs to participate in the questionnaire portion of the study. In the future this study should start earlier in the spring to allow adequate time for all the preschool parents to complete the questionnaire. Unfortunately no home childcare centers participated and only a limited amount of Head Start and CA State preschools were assessed. Getting more preschools involved in the study will increase the sample size, giving a greater representation of the county. Considering that there was a greater than 30% increase in the amount of OW/OB preschool children from 2006 to 2009/2010, suggests that current programs and funding are not adequate. Repeating this study every three years will provide longitudinal data on the health of SLO County preschool children. This information could be helpful to the community, public health services, and the medical field in SLO County in the prevention of overweight, obesity and health complications that are related. Programs could be created or restructured and funds could also be better distributed to serve the populations that are at greater risk.

**Recommendations for Next Study**

The following are recommendations for the A-Team to improve on the current study for next study.

1) Start the physical assessments at least 6 weeks before the preschools dismiss for break.

2) Attend meetings run by different community organizations (Community Action Partnership, HEAL SLO, and Child Care Planning Council) to create relationships with community leaders that work with preschools and people with preschool-aged children.
3) Visit the preschools to talk to the directors and meet the preschool teachers to discuss what the study is about and why it is important to participate. The preschool teachers are in direct contact with the parents and would be able to better communicate the importance of the study.

4) Attending the preschools’ parent meeting and having them complete the questionnaire at the time could help increase the response rate and A-Team members can answer questions.

5) Physical assessments should be in the first 4 weeks and allow 2 weeks after for the last preschools’ parents’ time to complete the questionnaire and return it.

6) Schedule preschools in the same area on the same day with half an hour in between scheduled times to drive and set up.

7) Teams that travel to the preschools should have 3 A-Team members for each set of equipment (stadiometer and digital scale).

8) The A-Team needs to be large enough to have multiple teams to go to different sites around the county.

9) Have the preschool directors send name and birthdates of the children before the physical assessments to create the coding. This will help save time during data collection.

10) Add a response for milk other than cow’s milk for the type of milk item on the questionnaire.


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consumption patterns associated with weight status and nutrient adequacy in

change as a predictor of child weight change in family-based behavioral obesity
Appendix A Letter from the Public Health Department’s RD

Dayna Ravalin, RD, CDE
County Public Health Department
286 South 16th Street
Grover Beach, CA  93433

March 15, 2009

Dear Preschool/Childcare Center Director:

Once again the Public Health department is partnering with Cal Poly’s Kinesiology Department to gather growth and lifestyle data from our county’s families. This study is being led by Master’s candidate, Kyla Tom.

We would like to invite your center to be a part of this exciting and informative data collection. Kyla and her assessment teams will gather family lifestyle data from study participants via a written questionnaire, and they will be collecting BMI information by measuring children’s heights and weights. The height and weight measurements of your center’s children would take place at your convenience in the latter part of April and the first few weeks of May. The data collection would include children at your center who are 3-5 years of age. This data would be collected only after receiving prior parental consent.
Please consider participating in this important data collection. As in years past, this information may be used to obtain financial support for nutrition and health services for our community as well as identify areas of educational needs.

Feel free to contact myself or Kyla Tom for further information. If you would like to sign up to have your children measured, you may contact Kyla who will be scheduling measurement visits.

Contact information: Kyla Tom at kyla.tom@gmail.com or by phone at (650)279-3301 or contact me at dravalin@co.slo.ca.us or (805) 473-7053.

Thank you and we look forward to hearing from you.

Sincerely,

Dayna Ravalin, RD, CDE

Public Health Nutritionist
Appendix B Community Action Partnership (CAP) of San Luis Obispo County

Newsletter
### Appendix C Data Record Form

**Preschool Study Spring 2010**

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<tr>
<td>2 Weight</td>
<td>Measure 1 Measure 2 Measure 3 Average kg (to nearest 0.1 kg)</td>
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<tr>
<td>3 BMI (calculated later)</td>
<td>Kg/m² Percentile Weight Classification</td>
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<td>Month (2 digits) Day (2 digits) Year (4 digits)</td>
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<td>Hispanic? Yes No Race</td>
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Appendix D CDC Growth Charts
## 2 to 20 years: Girls

### Body mass index-for-age percentiles

<table>
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<tr>
<th>Date</th>
<th>Age</th>
<th>Weight</th>
<th>Stature</th>
<th>BMI*</th>
<th>Comments</th>
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</table>

*To Calculate BMI: Weight (kg) = Stature (cm) x Stature (cm) x 10,000
  or Weight (lb) = Stature (in) x Stature (in) x 703

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Published: May 30, 2000 (modified 10/16/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

SAFER • HEALTHIER PEOPLE™
Appendix E Parent Questionnaire in English

Healthy Preschool Children Questionnaire

Please have the primary caregiver complete this survey.

Please answer the next questions about you.

1. I am the child’s (Please check one):
   - ☐ Mother
   - ☐ Father
   - ☐ Grandparent
   - ☐ Legal Guardian
   - ☐ Other ____________________

2. I am: ☐ male ☐ female

3. My age: ________ years ☐ I do not want to report

4. My height: ________ feet ______ inches ☐ I do not want to report

5. My current weight: ________ pounds ☐ I do not want to report

6. Please rate the extent that you agree with this statement:
   In general, I am a healthy person. (Please check one)
   - ☐ Strongly Disagree
   - ☐ Disagree
   - ☐ Undecided
   - ☐ Agree
   - ☐ Strongly Agree

7. I consider myself (Please check one)
   - ☐ Very Underweight
   - ☐ Underweight
   - ☐ About the Right Weight
   - ☐ Overweight
   - ☐ Very Overweight

8. What is your yearly family income? (Please check one):
   - ☐ Less than $10,000
   - ☐ More than $10,000 but less than $25,000
   - ☐ More than $25,000 but less than $50,000
   - ☐ More than $50,000 but less than $75,000
   - ☐ More than $75,000 but less than $100,000
   - ☐ More than $100,000
   - ☐ I do not want to report
9. What is the highest level of school you have finished? (Please check one)
   □ Less than 7th grade    □ Some college or Vocational Training
   □ Junior High/Middle School          □ Finished College or University
   □ Some High School           □ Finished Graduate Degree
   □ Finished High School/GED    □ I do not want to report

10. Are you Latino/Hispanic/Spanish? (Please check one)  □ Yes  □ No

11. Which of the next best describes your racial/ethnic background? (Please check all that apply)
   □ African American    □ Pacific Islander
   □ American Indian    □ Puerto Rican
   □ Asian            □ White
   □ Cuban              □ Other
   □ Mexican, Mexican American, Chicano

Please answer the next questions are about your 3-5 year old child in preschool.

12. Please rate the extent that you agree with this statement:
   In general, my child is healthy. (Please check one)
   □ Strongly Disagree  □ Disagree  □ Undecided  □ Agree  □ Strongly Agree

13. My child’s date of birth is _______ Month _______ Day _______ Year

14. My child is a  □ Boy  □ Girl

15. My child is Latino/Hispanic/Spanish? (Please check one)  □ Yes  □ No

16. Which of the next best describes your child’s racial background? (Please check all that apply)
   □ African American    □ Mexican, Mexican American, Chicano
   □ American Indian    □ Puerto Rican
   □ Asian              □ Cuban
   □ White               □ Other
   □ Pacific Islander
17. When it comes to my child’s weight, my child is (Please check one):
  □ Very Underweight □ Underweight □ About the Right Weight □ Overweight □ Very Overweight

18. At birth my child weighed _________ Pounds _________ Ounces

19. At birth my child’s length was _________ Inches

20. What health insurance plan does your child have? (Please check one):
  □ None □ Health insurance through parent’s employer □ Healthy Families □ Healthy Kids
  □ Private medical insurance □ Military health insurance (TRICARE) □ Other __________________________

21. Has your child’s doctor ever told you that your child has (Please check all that apply):
  □ Acanthosis Nigricans (dark, velvety skin) □ High blood pressure □ Shortness of breath during sleep or snoring
  □ Asthma □ Diabetes □ Type I □ Type II □ Unknown □ Overweight/Obese
  □ Other disease or medical condition

Please indicate: ________________________________
For the next 4 questions use these as guidelines for the amount of ounces:

12 oz = Happy Meal fountain drink or can of soda pop, 6.75 oz = Juice Box and 20 oz = bottle of soda pop

22. During the **past 24 hours**, how much soda pop did your child drink? (Please check one)

- None or 0 oz
- 1-6 oz
- 6-12 oz
- 12-16 oz
- 16-24 oz
- More than 24 oz
- I do not know

23. During the **past 24 hours**, how many ounces of sugary drinks did your child drink?

Examples are 100% juice, apple juice, Capri Sun, Gatorade, juice box, Sunny Delight (Please check one)

- None or 0 oz
- 1-6 oz
- 6-12 oz
- 12-16 oz
- 16-24 oz
- More than 24 oz
- I do not know

24. During the **past 24 hours**, how much water did your child drink? (Please check one)

- None or 0 oz
- 1-6 oz
- 6-12 oz
- 12-16 oz
- 16-24 oz
- More than 24 oz
- I do not know

25. During the **past 24 hours**, how much milk did your child drink? (Please check one)

- None or 0 oz
- 1-6 oz
- 6-12 oz
- 12-16 oz
- 16-24 oz
- More than 24 oz
- I do not know

26. What type of milk does your child drink?

- Whole Milk
- Reduced Fat Milk (1% or 2%)
- Non-fat Milk

27. In the **last 7 days**, how many meals did your child eat at a fast food place, restaurant, deli, or eat take out.

- None or 0 meals
- 1-2 meals
- 3-5 meals
- 6-8 meals
- More than 8 meals
28. How many days out of the 7 day week does your child eat breakfast?

☐ None or 0 days  ☐ 1-2 days  ☐ 3-4 days  ☐ 5-6 days  ☐ Every day or 7 days

29. How many days out of the 7 day week does your child eat dinner as a family?

☐ None or 0 days  ☐ 1-2 days  ☐ 3-4 days  ☐ 5-6 days  ☐ Every day or 7 days

30. What best describes your baby’s intake of milk or formula over his/her first 6 months of life?

☐ Breast Only  ☐ Mostly Breast Milk  ☐ Breast Milk and Formula  ☐ Formula Only  ☐ Neither Breast Milk or Formula

31. As a baby, what age was your child when you started to feed him/her solid foods (example: baby food, baby cereal).

☐ Less than 1 month  ☐ 1-2 months  ☐ 3-4 months  ☐ 5-9 months  ☐ More than 9 months

32. On school days, what time does your child usually go to bed? ________________________

33. On school days, what time does your child usually wake up in the morning? __________

34. Does your child usually sleep through the night?  ☐ Yes  ☐ No

Physical activity is any activity, indoor or outdoor, that increases your child’s heart rate and makes your child get out of breath some of the time. It can be done in sports, playing with friends, or walking to school. Some examples are running, jumping, brisk walking, dancing, swimming, soccer, and martial arts.

35. On average, how many minutes per day is your child active?

☐ 0-15 minutes  ☐ 15-30 minutes  ☐ 30-60 minutes  ☐ 1-2 hours  ☐ More than 2 hours  ☐ I do not know

36. How many TVs are in the house that your child lives in? ________________________ TVs

37. Is there a TV in the room that your child mostly sleeps in? (Please check one):  ☐ Yes  ☐ No
38. On average, how many **hours per week** does your child spend watching TV (include cable, VCR, DVD, video games, hand held video games, computer)?

<table>
<thead>
<tr>
<th>Options</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
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<td>0-7 hours</td>
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<td>I do not know</td>
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</table>

Please check one box per question that applies to your child.

39. My child eats meals while watching TV or videos

40. My child snacks while watching TV or videos

41. Does your child watch TV or videos in the car on routine commutes less than 45 minutes?

42. Does your child eat or snack in the car on routine commutes less than 45 minutes?

43. How many other children (18 years old or younger) live in the same house as your preschool child? ______________ children

44. In the **last 7 days** how many hours did your child spend in a structured school environment?

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<thead>
<tr>
<th>Options</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
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<td>13-18 hours</td>
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<td>19-24 hours</td>
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<td>More than 25 hours</td>
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45. Any comments or thoughts?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Appendix F Parent Questionnaire in Spanish

Cuestionario de preescolares sanos

Por favor, para ser completado por el tutor principal.
Por favor conteste las siguientes preguntas sobre usted.

1. Yo soy el/la _______________ del niño (Por favor marque uno):
   □ Madre  □ Tutor Legal
   □ Padre  □ Otro _______________
   □ Abuelo/a

2. Yo soy:  □ Hombre  □ Mujer

3. Mi edad: __________ años □ Prefiero no reportar

4. Mi estatura es: __________ pies ______ pulgadas □ Prefiero no reportar

5. Mi peso actual es: __________ libras □ Prefiero no reportar

6. Por favor considere la medida en que usted está de acuerdo con cada frase:
   En general, soy una persona sana. (Por favor marque uno)
   □ Totalmente  □ En desacuerdo  □ Indeciso  □ De acuerdo  □ Totalmente de acuerdo

7. Me considero (Por favor marque uno)
   □ Muy bajo de peso  □ Bajo de peso  □ Aproximadamente peso correcto  □ Sobrepeso  □ Muy sobrepeso

8. ¿Cuál es su ingreso familiar anual? (Por favor marque uno):
   □ Menos de $10,000  □ Más de $75,000 pero menos de $100,000
   □ Más de $10,000 pero menos de $25,000  □ Más de $100,000
   □ Más de $25,000 pero menos de $50,000  □ Prefiero no reportar
   □ Más de $50,000 pero menos de $75,000
FACTORS THAT RELATE TO OVERWEIGHT AND OBESITY

9. ¿Cuál es el nivel más alto de estudios que ha completado? (Por favor marque uno)
   □ Menos de 7th grado  □ Algo de Universidad o Formación Profesional
   □ Secundaria/Escuela Intermedia  □ Completo colegio o Universidad
   □ Alguna Escuela Secundaria  □ Completo Titulo de Postgrado
   □ Termino la escuela secundaria/GED  □ Prefiero no reportar

10. Es Latino/Hispano/Espanol? (Por favor marque uno)  □ Sí  □ No

11. ¿Cuál de las siguientes mejor describe su raza/origen étnico? (Por favor marque todos los que corresponden)
   □ Afroamericano  □ Las Islas del Pacífico
   □ Indio Americano  □ Puerto Rico
   □ Asiático  □ Blanco
   □ Cubano  □ Otro
   □ Mexicano/a, Mexicano-Americano, Chicano

Por favor conteste las siguientes preguntas acerca de su hijo/a de edad de 3-5 años quien atiende preescolar.

12. Por favor considere la medida en que usted está de acuerdo con cada frase:

   En general, mi niño/a esta sano/a. (Por favor marque uno)
   □ Totalmente  □ En desacuerdo  □ Indeciso  □ De acuerdo  □ Totalmente de acuerdo

13. La fecha de nacimiento de mi hijo/a es ________ Mes ________ Dia ________ Ano

14. Mi hijo es:  □ Nino  □ Nina

15. Mi hijo es Latino/Hispano/Espanol? (Por favor marque uno)  □ Sí  □ No
16. ¿Cuál de las siguientes mejor describe su raza/origen étnica? (Por favor marque todos los que corresponden)

☐ Afroamericano
☐ Indio Americano
☐ Asiático
☐ Cubano
☐ Mexicano/a, Mexicano-Americano, Chicano
☐ Las Islas del Pacífico
☐ Puerto Rico
☐ Blanco
☐ Otro

17. Cuando se trata al peso de mi hijo, mi hijo está (Por favor marque uno):

☐ Muy bajo de peso
☐ Bajo de peso
☐ Aproximadamente peso correcto
☐ Sobre peso
☐ Muy sobre peso

18. Al nacer mi hijo/a peso __________ Libras __________ Onzas

19. Al nacer mi hijo/a midió __________ Pulgadas

20. ¿Qué plan de seguro de salud tiene su hijo/a? (Por favor marque uno):

☐ Ninguno
☐ Seguro de salud a través del trabajo de sus padres
☐ Seguro de salud privado
☐ Medi-Cal
☐ Healthy Families
☐ Healthy Kids
☐ Seguro de salud militar (TRICARE)
☐ Otro _______________________

21. Alguna vez le ha dicho el médico de su hijo/a que tiene (Por favor marque lo que corresponda):

☐ Acantosis Nigra (piel aterciopelada, oscura)
☐ Asma
☐ Diabetes
☐ Tipo I ☐ Tipo II ☐ Desconocido
☐ Presión arterial alta
☐ Dificultad para respirar durante el sueño o ronquido
☐ Sobrepeso/Obesos
☐ Otra enfermedad o condición médica

Por favor indique: ___________________________________________
Para las siguientes 4 preguntas utilice las directrices para la cantidad de onzas:
12 oz = Bebida de Happy Meal o lata de refresco (soda), 6.75 oz = Caja de jugo, 20 oz = Botella de soda

22. ¿Durante las últimas 24 horas, cuanta soda ha bebido su hijo/a? (Por favor marque uno)
   □ Ninguna □ 0 oz □ 1-6 oz □ 6-12 oz □ 12-16 oz □ 16-24 oz □ Más de 24 oz □ No se

23. ¿Durante las últimas 24 horas, cuantas onzas de bebidas azucaradas ha bebido su hijo/a?
   Por ejemplo, 100% de jugo, jugo de manzana, Capri Sun, Gatorade, caja de jugo, Sunny Delight (Por favor marque uno)
   □ Ninguna □ 0 oz □ 1-6 oz □ 6-12 oz □ 12-16 oz □ 16-24 oz □ Más de 24 oz □ No se

24. ¿Durante las últimas 24 horas, cuánta agua ha bebido su hijo/a? (Por favor marque uno)
   □ Ninguna □ 0 oz □ 1-6 oz □ 6-12 oz □ 12-16 oz □ 16-24 oz □ Más de 24 oz □ No se

25. ¿Durante las últimas 24 horas, cuanta leche ha bebido su hijo/a? (Por favor marque uno)
   □ Ninguna □ 0 oz □ 1-6 oz □ 6-12 oz □ 12-16 oz □ 16-24 oz □ Más de 24 oz □ No se

26. ¿Qué tipo de leche bebe su hijo/a?
   □ Leche entera □ Leche reducida en grasa (1% o 2%) □ Lech sin grasa

27. En los últimos 7 días, ¿Cuántos alimentos ha comido su hijo/a en un restaurante, restaurant de comida rápida, delicatessen o comida para llevar?
   □ Ningunas o 0 alimentos □ 1-2 alimentos □ 3-5 alimentos □ 6-8 alimentos □ Más de 8 alimentos

28. ¿Cuántos días de los 7 días de la semana, desayuna su hijo/a?
   □ Ningunos o 0 días □ 1-2 días □ 3-4 días □ 5-6 días □ Todos los o 7 días
29. ¿Cuántos días de los 7 días de la semana, cena su hijo/a en familia?
   □ Ningunos o  □ 1-2 días  □ 3-4 días  □ 5-6 días  □ Todos los o 7 días

30. ¿Cuál describe mejor la ingesta de leche o fórmula de su bebe durante los primeros 6 meses de vida?
   □ Pecho solamente  □ Pecho la mayoría del tiempo  □ Pecho y fórmula  □ Fórmula solamente  □ Ni pecho o fórmula

31. Como bebe, ¿cuántos años tenía su hijo/a cuando le comenzó a dar comida sólida? (por ejemplo: comida para bebés, cereal para bebés).
   □ Menos de un (1) mes  □ 1-2 Meses  □ 3-4 Meses  □ 5-9 Meses  □ Más de 9 meses

32. ¿En días de escuela, generalmente a qué hora va a cama su hijo/a? __________________________

33. ¿En días de escuela, a qué hora se despierta su hijo/a? __________________________

34. ¿Usualmente duerme su hijo/a toda la noche? □ Sí □ No

Actividad física es cualquier actividad, afuera o adentro, que aumenta el ritmo del corazón de su hijo y hace que su hijo se quede sin aire en algunas ocasiones. Se puede hacer en el deporte, jugando con amigos o caminando a la escuela. Algunos ejemplos son correr, saltar, caminar rápido, baile, natación, fútbol y artes marciales.

35. En promedio, ¿cuántos minutos por día es activo su hijo/a?
   □ 0-15 minutos □ 15-30 minutos □ 30-60 minutos □ 1-2 horas □ Más de 2 horas □ No se cuenta

36. ¿Cuántas televisiones hay en la casa que vive su hijo/a? ________________Televisiones

37. ¿Hay una televisión en el cuarto adonde duerme su hijo/a la mayoría del tiempo? (Por favor marque uno)
   □ Sí □ No
38. En promedio, ¿cuántas horas por semana, pasa su hijo/a mirando la televisión (incluye cable, VCR, DVD, videojuegos, videojuegos de mano, computadora)?

☐ 0-7 horas  ☐ 8-14 horas  ☐ 15-20 horas  ☐ 21-28 horas  ☐ Más de 28 horas  ☐ No se

Por favor, marque una caja por cada pregunta que se le aplica a su hijo.

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<th>Pregunta</th>
<th>Siempre</th>
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<th>A veces</th>
<th>Raras veces</th>
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<tr>
<td>Mi hijo/a come bocadillos mientras ve la televisión o videos</td>
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<tr>
<td>Su hijo/a ve la televisión o videos en el carro durante viajes menos de 45 minutos.</td>
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<tr>
<td>Su hijo/a come en el carro durante viajes menos de 45 minutos.</td>
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</table>

43. ¿Cuántos otros niños (18 años o menos) viven en la misma casa que su hijo preescolar?
   __________ ninos

44. ¿Durante los últimos 7 días cuantas horas paso su hijo en un ambiente escolar estructurado?

☐ 0-6 horas  ☐ 7-12 horas  ☐ 13-18 horas  ☐ 19-24 horas  ☐ Más de 25 horas

45. ¿Comentarios o pensamientos?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Appendix G Descriptive Statistics for Questionnaire Items

Table 11

*Preschool Children’s Weight Classification Distributed by Guardian Weight Class*

<table>
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<td>43 (24.02)</td>
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<tr>
<td>Under Weight</td>
<td>7 (87.5)</td>
<td>1 (12.5)</td>
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<td>n = 8 (4.47 %)</td>
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<tr>
<td>Normal Weight</td>
<td>79 (81.44)</td>
<td>18 (18.56)</td>
</tr>
<tr>
<td>n = 97 (54.12 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>37 (74.00)</td>
<td>13 (26.00)</td>
</tr>
<tr>
<td>n = 50 (27.93 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese grade 1</td>
<td>8 (57.14)</td>
<td>6 (42.86)</td>
</tr>
<tr>
<td>n = 14 (7.82 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese grade 2</td>
<td>3 (50.00)</td>
<td>3 (50.00)</td>
</tr>
<tr>
<td>n = 6 (3.35 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese grade 3</td>
<td>2 (50.00)</td>
<td>2 (50.00)</td>
</tr>
<tr>
<td>n = 4 (2.23 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Due to rounding, some percentages may not equal to 100%*
Table 12

*Preschool Children’s Weight Classification Distributed among Guardian Income*

<table>
<thead>
<tr>
<th>Guardian Income</th>
<th>NW (%)</th>
<th>OW/OB (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>156 (72.56)</td>
<td>59 (27.44)</td>
</tr>
<tr>
<td>n = 215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $10,000</td>
<td>11 (68.75)</td>
<td>5 (31.25)</td>
</tr>
<tr>
<td>n = 16 (7.44 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$10,000-$25,000</td>
<td>24 (55.81)</td>
<td>19 (44.19)</td>
</tr>
<tr>
<td>n = 43 (20.00 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$25,000-$50,000</td>
<td>28 (75.68)</td>
<td>9 (24.32)</td>
</tr>
<tr>
<td>n = 37 (17.21 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$50,000-$75,000</td>
<td>21 (84.00)</td>
<td>4 (16.00)</td>
</tr>
<tr>
<td>n = 25 (11.63 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$75,000-$100,000</td>
<td>24 (80.00)</td>
<td>6 (20.00)</td>
</tr>
<tr>
<td>n = 30 (13.95 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than $100,000</td>
<td>35 (81.40)</td>
<td>8 (18.60)</td>
</tr>
<tr>
<td>n = 43 (20.00 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not want to report</td>
<td>13 (61.90)</td>
<td>8 (38.10)</td>
</tr>
<tr>
<td>n = 21 (9.77 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 13

*Preschool Children’s Weight Classification Distributed among Guardian Education*

<table>
<thead>
<tr>
<th>Guardian Education</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>157 (72.67)</td>
<td>59 (27.31)</td>
</tr>
<tr>
<td></td>
<td>n = 216</td>
<td></td>
</tr>
<tr>
<td><strong>Less than 7th grade</strong></td>
<td>5 (62.50)</td>
<td>3 (37.50)</td>
</tr>
<tr>
<td></td>
<td>n = 8 (3.70 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Junior high/middle school</strong></td>
<td>7 (70.00)</td>
<td>3 (30.00)</td>
</tr>
<tr>
<td></td>
<td>n = 10 (4.63 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Some high school</strong></td>
<td>4 (40.00)</td>
<td>6 (60.00)</td>
</tr>
<tr>
<td></td>
<td>n = 10 (4.63 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Finished high school/GED</strong></td>
<td>17 (68.00)</td>
<td>8 (32.00)</td>
</tr>
<tr>
<td></td>
<td>n = 25 (11.57 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Some college or vocational training</strong></td>
<td>43 (70.49)</td>
<td>18 (29.51)</td>
</tr>
<tr>
<td></td>
<td>n = 61 (28.24 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Finished college or university</strong></td>
<td>48 (82.76)</td>
<td>10 (17.24)</td>
</tr>
<tr>
<td></td>
<td>n = 58 (26.85 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Finished graduate degree</strong></td>
<td>32 (76.19)</td>
<td>10 (23.81)</td>
</tr>
<tr>
<td></td>
<td>n = 42 (19.44 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Do not want to report</strong></td>
<td>1 (50.00)</td>
<td>1 (50.00)</td>
</tr>
<tr>
<td></td>
<td>n = 2 (0.93 %)</td>
<td></td>
</tr>
</tbody>
</table>
Table 14

*Preschool Children’s Weight Classification Distributed among Parent Perceived Health Status of Child*

<table>
<thead>
<tr>
<th>Parent Perceived Health Status of Child</th>
<th>NW</th>
<th>OW/OB</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>156</td>
<td>57</td>
<td>(73.24)</td>
</tr>
<tr>
<td></td>
<td>n = 213</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>72</td>
<td>29</td>
<td>(71.29)</td>
</tr>
<tr>
<td></td>
<td>n = 101</td>
<td>(47.42 %)</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>76</td>
<td>26</td>
<td>(74.51)</td>
</tr>
<tr>
<td></td>
<td>n = 102</td>
<td>(47.89 %)</td>
<td></td>
</tr>
<tr>
<td>Undecided</td>
<td>6</td>
<td>1</td>
<td>(85.71)</td>
</tr>
<tr>
<td></td>
<td>n = 7</td>
<td>(3.29 %)</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
<td>(0.00)</td>
</tr>
<tr>
<td></td>
<td>n = 0</td>
<td>(0.00 %)</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>2</td>
<td>1</td>
<td>(66.67)</td>
</tr>
<tr>
<td></td>
<td>n = 3</td>
<td>(1.41 %)</td>
<td></td>
</tr>
</tbody>
</table>
Table 15

Preschool Children’s Weight Classification Distributed among Parent Accuracy of Perception of their Child’s Weight Classification

<table>
<thead>
<tr>
<th>Parent Accuracy of Perception of their Child’s Weight Classification</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>157 (72.67)</td>
<td>59 (27.31)</td>
</tr>
<tr>
<td></td>
<td>n = 216</td>
<td></td>
</tr>
<tr>
<td>Under</td>
<td>7 (10.61)</td>
<td>59 (89.39)</td>
</tr>
<tr>
<td></td>
<td>n = 66 (30.56 %)</td>
<td></td>
</tr>
<tr>
<td>Correct</td>
<td>150 (100.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td></td>
<td>n = 8 (69.44 %)</td>
<td></td>
</tr>
<tr>
<td>Over</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td></td>
<td>n = 0 (0.00 %)</td>
<td></td>
</tr>
</tbody>
</table>
Table 16

*Preschool Children’s Weight Classification Distributed among Type of Health Insurance*

<table>
<thead>
<tr>
<th>Type of Health Insurance</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>156 (72.56)</td>
<td>59 (27.44)</td>
</tr>
<tr>
<td>n = 215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>2 (40.00)</td>
<td>3 (60.00)</td>
</tr>
<tr>
<td>n = 0 (0.00 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health insurance through parent’s employer</td>
<td>75 (80.65)</td>
<td>18 (19.35)</td>
</tr>
<tr>
<td>n = 0 (0.00 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private medical insurance</td>
<td>24 (77.42)</td>
<td>7 (22.58)</td>
</tr>
<tr>
<td>n = 0 (0.00 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medi-Cal</td>
<td>33 (55.00)</td>
<td>27 (45.00)</td>
</tr>
<tr>
<td>n = 60 (27.91 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy Families</td>
<td>16 (88.89)</td>
<td>2 (11.11)</td>
</tr>
<tr>
<td>n = 18 (8.37 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Kids</td>
<td>3 (60.00)</td>
<td>2 (40.00)</td>
</tr>
<tr>
<td>n = 5 (2.33 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military health insurance (TRICARE)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>n = 0 (0.00 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3 (100.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>n = 3 (1.40 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 17

*Preschool Children’s Weight Classification Distributed among Other Conditions*

<table>
<thead>
<tr>
<th>Other Conditions</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acanthosis</strong> n = 216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False</td>
<td>157 (72.67)</td>
<td>59 (27.31)</td>
</tr>
<tr>
<td></td>
<td>n = 216 (100.00 %)</td>
<td></td>
</tr>
<tr>
<td>True</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td></td>
<td>n = 0 (0.00 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Asthma</strong> n = 216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False</td>
<td>148 (73.27)</td>
<td>54 (26.73)</td>
</tr>
<tr>
<td></td>
<td>n = 202 (93.52 %)</td>
<td></td>
</tr>
<tr>
<td>True</td>
<td>9 (64.29)</td>
<td>5 (35.71)</td>
</tr>
<tr>
<td></td>
<td>n = 14 (6.48 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Diabetes Type 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>False</td>
<td>157 (72.67)</td>
<td>59 (27.31)</td>
</tr>
<tr>
<td></td>
<td>n = 216 (100.00 %)</td>
<td></td>
</tr>
<tr>
<td>True</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td></td>
<td>n = 0 (0.00 %)</td>
<td></td>
</tr>
<tr>
<td><strong>Diabetes Type 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>n = 216 (100.00 %)</td>
<td>n = 0 (0.00 %)</td>
</tr>
<tr>
<td>Diabetes unknown</td>
<td>157 (72.67)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>157 (72.67)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>153 (72.17)</td>
<td>4 (100.00)</td>
</tr>
</tbody>
</table>

n = 0 (0.00 %)
### FACTORS THAT RELATE TO OVERWEIGHT AND OBESITY

<table>
<thead>
<tr>
<th></th>
<th>False</th>
<th>True</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OW/OB</strong></td>
<td><strong>n = 216 (100.00 %)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>157 (73.36)</td>
<td>57 (26.64)</td>
</tr>
<tr>
<td><strong>n = 214 (99.07 %)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>True</strong></td>
<td>0 (0.00)</td>
<td>2 (100.00)</td>
</tr>
<tr>
<td><strong>n = 2 (0.93 %)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>False</th>
<th>True</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other Diseases</strong></td>
<td><strong>n = 216 (100.00 %)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>144 (73.47)</td>
<td>52 (26.53)</td>
</tr>
<tr>
<td><strong>n = 196 (90.74 %)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>True</strong></td>
<td>13 (65.00)</td>
<td>7 (35.00)</td>
</tr>
<tr>
<td><strong>n = 20 (9.26 %)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 18

*Preschool Children’s Weight Classification Distributed among Soda Intake*

<table>
<thead>
<tr>
<th>Soda intake (oz per day)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>156 (73.24)</td>
<td>57 (26.76)</td>
</tr>
<tr>
<td>n = 213</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&gt; 6 oz)</td>
<td>149 (74.50)</td>
<td>51 (25.50)</td>
</tr>
<tr>
<td>n = 200 (93.90 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (6-12 oz)</td>
<td>7 (58.33)</td>
<td>5 (41.67)</td>
</tr>
<tr>
<td>n = 12 (5.63 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 12 oz)</td>
<td>0 (0.00)</td>
<td>1 (100.00)</td>
</tr>
<tr>
<td>n = 1 (0.47 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Preschool Children’s Weight Classification Distributed among Sweetened Beverage Intake

<table>
<thead>
<tr>
<th>Sweetened Beverage Intake (oz per day)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>155 (72.77%)</td>
<td>58 (27.23%)</td>
</tr>
<tr>
<td>n = 213</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt; 6 oz)</td>
<td>81 (71.68%)</td>
<td>32 (28.32%)</td>
</tr>
<tr>
<td>n = 113 (53.05 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (6-12 oz)</td>
<td>49 (75.38%)</td>
<td>16 (24.62%)</td>
</tr>
<tr>
<td>n = 65 (30.52 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 12 oz)</td>
<td>25 (71.43%)</td>
<td>10 (28.57%)</td>
</tr>
<tr>
<td>n = 35 (16.43 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 20

*Preschool Children’s Weight Classification Distributed among Water Intake*

<table>
<thead>
<tr>
<th>Water Intake (oz per day)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>149 (72.68)</td>
<td>56 (27.32)</td>
</tr>
<tr>
<td>n = 205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt; 6 oz)</td>
<td>15 (83.33)</td>
<td>3 (16.67)</td>
</tr>
<tr>
<td>n = 18 (8.78 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (6-12 oz)</td>
<td>45 (80.36)</td>
<td>11 (19.64)</td>
</tr>
<tr>
<td>n = 56 (27.32 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-12 oz</td>
<td>89 (67.94)</td>
<td>42 (32.06)</td>
</tr>
<tr>
<td>n = 131 (63.90 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 21

*Preschool Children’s Weight Classification Distributed among Milk Intake*

<table>
<thead>
<tr>
<th>Milk Intake (oz per day)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>135 (71.81)</td>
<td>53 (28.19)</td>
</tr>
<tr>
<td>n = 188</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt; 6 oz)</td>
<td>30 (62.50)</td>
<td>18 (37.50)</td>
</tr>
<tr>
<td>n = 48 (25.53 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (6-12 oz)</td>
<td>52 (73.24)</td>
<td>19 (26.76)</td>
</tr>
<tr>
<td>n = 71 (37.77 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 12 oz)</td>
<td>53 (76.81)</td>
<td>16 (23.19)</td>
</tr>
<tr>
<td>n = 69 (36.70 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 22

*Preschool Children’s Weight Classification Distributed among Milk Type*

<table>
<thead>
<tr>
<th>Milk Type</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total *</td>
<td>149 (72.68)</td>
<td>56 (27.32)</td>
</tr>
<tr>
<td>n = 205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-fat milk</td>
<td>14 (77.78)</td>
<td>4 (22.22)</td>
</tr>
<tr>
<td>n = 18 (8.78 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced fat milk</td>
<td>110 (70.51)</td>
<td>46 (29.49)</td>
</tr>
<tr>
<td>n = 156 (76.10 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole milk</td>
<td>25 (80.65)</td>
<td>6 (19.35)</td>
</tr>
<tr>
<td>n = 31 (15.12 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Children whose parents responded none or 0oz were not included because many parents responded that their child drank a milk substitute, such as soy milk. Only children who drank milk from cows were included in the study.*
Table 23

*Preschool Children’s Weight Classification Distributed among Fast Food/Restaurant Eating*

<table>
<thead>
<tr>
<th>Fast Food/Restaurant Eating (meals per week)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>155 (72.43)</td>
<td>59 (27.57)</td>
</tr>
<tr>
<td>n = 214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None or 0 meals</td>
<td>47 (81.03)</td>
<td>11 (18.97)</td>
</tr>
<tr>
<td>n = 58 (27.10 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (1-2 meals)</td>
<td>95 (67.38)</td>
<td>46 (32.62)</td>
</tr>
<tr>
<td>n = 141 (65.89 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 2 meals)</td>
<td>13 (86.67)</td>
<td>2 (13.33)</td>
</tr>
<tr>
<td>n = 15 (7.01 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 24

*Preschool Children’s Weight Classification Distributed among Breakfast Habits*

<table>
<thead>
<tr>
<th>Breakfast Habits (number of days eating breakfast per week)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total *</td>
<td>156 (72.90)</td>
<td>58 (27.10)</td>
</tr>
<tr>
<td>n = 214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt;3 days)</td>
<td>3 (75.00)</td>
<td>1 (25.00)</td>
</tr>
<tr>
<td>n = 4 (1.87 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (3-6 days)</td>
<td>15 (60.00)</td>
<td>10 (40.00)</td>
</tr>
<tr>
<td>n = 25 (11.68 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (7 days)</td>
<td>138 (74.59)</td>
<td>47 (25.41)</td>
</tr>
<tr>
<td>n = 185 (86.49 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Due to rounding, some totals may not add to 100 %

*Children whose parents responded none were excluded because sample size was insufficient.*
Table 25

*Preschool Children’s Weight Classification Distributed among Physical Activity*

<table>
<thead>
<tr>
<th>Physical Activity (hours per day)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>148 (72.55)</td>
<td>56 (37.84)</td>
</tr>
<tr>
<td>n = 204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt; 1 hour)</td>
<td>25 (75.76)</td>
<td>8 (24.24)</td>
</tr>
<tr>
<td>n = 33 (16.18 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (1-2 hours)</td>
<td>43 (70.49)</td>
<td>18 (29.51)</td>
</tr>
<tr>
<td>n = 61 (29.90 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 2 hours)</td>
<td>80 (72.73)</td>
<td>30 (27.27)</td>
</tr>
<tr>
<td>n = 110 (53.92 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 26

*Preschool Children’s Weight Classification Distributed among TV in Child’s Room*

<table>
<thead>
<tr>
<th>TV in Child’s Room</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>157 (72.69)</td>
<td>59 (27.31)</td>
</tr>
<tr>
<td>n = 216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False</td>
<td>111 (77.08)</td>
<td>33 (22.92)</td>
</tr>
<tr>
<td>n = 144 (66.67 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>True</td>
<td>46 (63.89)</td>
<td>26 (36.11)</td>
</tr>
<tr>
<td>n = 72 (33.33 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 27

*Preschool Children’s Weight Classification Distributed among Screen Time*

<table>
<thead>
<tr>
<th>Screen Time (hours per week)</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>150 (72.82)</td>
<td>56 (27.18)</td>
</tr>
<tr>
<td>n = 206</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (0-7 hours)</td>
<td>64 (71.91)</td>
<td>25 (28.09)</td>
</tr>
<tr>
<td>n = 89 (43.20 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (8-14 hours)</td>
<td>61 (78.21)</td>
<td>17 (21.79)</td>
</tr>
<tr>
<td>n = 78 (37.86 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt; 20 hours)</td>
<td>25 (64.10)</td>
<td>14 (35.90)</td>
</tr>
<tr>
<td>n = 39 (18.93 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Due to rounding, some totals may not add to 100%
Table 28

*Preschool Children’s Weight Classification Distributed among Eating While Watching TV*

<table>
<thead>
<tr>
<th>Eating While Watching TV</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>153 (72.51)</td>
<td>58 (27.49)</td>
</tr>
<tr>
<td>n = 211</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>49 (81.67)</td>
<td>11 (18.33)</td>
</tr>
<tr>
<td>n = 60 (28.44 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (Rarely and Sometimes)</td>
<td>90 (70.87)</td>
<td>37 (29.13)</td>
</tr>
<tr>
<td>n = 127 (60.19 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (Often and Always)</td>
<td>14 (58.33)</td>
<td>10 (41.67)</td>
</tr>
<tr>
<td>n = 24 (11.37 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 29

*Preschool Children’s Weight Classification Distributed among Snacking While Watching TV*

<table>
<thead>
<tr>
<th>Snacking While Watching TV</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>155 (72.77)</td>
<td>58 (27.23)</td>
</tr>
<tr>
<td>n = 213</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>30 (78.95)</td>
<td>8 (21.05)</td>
</tr>
<tr>
<td>n = 38 (17.84 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (Rarely and Sometimes)</td>
<td>111 (72.08)</td>
<td>43 (27.92)</td>
</tr>
<tr>
<td>n = 154 (72.30 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (Often and Always)</td>
<td>14 (66.67)</td>
<td>7 (33.33)</td>
</tr>
<tr>
<td>n = 21 (9.86 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 30

*Preschool Children’s Weight Classification Distributed among Watching TV in the Car*

<table>
<thead>
<tr>
<th>Watching TV in the Car</th>
<th>NW</th>
<th>OW/OB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>153 (72.51)</td>
<td>58 (27.49)</td>
</tr>
<tr>
<td>n = 211</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>127 (72.99)</td>
<td>47 (27.01)</td>
</tr>
<tr>
<td>n = 174 (82.46 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>24 (72.73)</td>
<td>9 (27.27)</td>
</tr>
<tr>
<td>n = 33 (15.64 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>2 (50.00)</td>
<td>2 (50.00)</td>
</tr>
<tr>
<td>n = 4 (1.90 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>