PREVENTION OF CHILDHOOD OBESITY IN FAMILIES LIVING IN POVERTY

A master’s project submitted in partial fulfillment of the requirements for the degree of

MASTERS OF NURSING

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May 2012
To the Faculty of Washington State University

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Abstract

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May 2012

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Submitting to: Journal of the American Academy of Nurse Practitioners

Childhood obesity has increased three fold since the 1960's. In the United States, 12.5 million children and teens are affected by obesity. The highest childhood obesity rates are associated with low family incomes and low head of household education. Childhood obesity has both immediate and long-term harmful effects. Obese children are more likely to have hypertension, abnormal glucose tolerance, increased incidence in respiratory illnesses, joint problems, gallstones, fatty liver and psychosocial issues. Current guidelines established by the American Academy of Pediatrics on the assessment, prevention, and treatment of childhood obesity address the recommendations of the problem. However, they do not take into consideration the special circumstances of children living in poverty. Children living in poverty are limited by economic resources, potential unsafe neighborhoods, and genetic predispositions to obesity. This article explores specific interventions that have worked for children living in poverty and applies them to future prevention strategies.

Key Words: Poverty, Prevention, childhood obesity
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Prevention of Childhood Obesity in Families Living in Poverty

Childhood obesity is a leading health concern that disproportionately affects low income children and adolescents. The Center for Disease Control Nutrition Surveillance System in 2008 indicated obesity among low income preschool aged children, ages 2-5, rose from 5% to 10.4% between 1976 and 2008 (Center for Disease Control, 2010). An assessment of 16,000 preschool children enrolled in the New York City Head Start Program found one in three children were obese by age 4. Among low income children, ages 6-11, obesity doubled over the past twenty years, increasing from 6.5% in 1980 to 17.0% in 2006 (Li & Hooker, 2010). Adolescents living in poverty have a 50% higher risk of obesity than adolescents from more affluent families (Koplan, Liverman, Kraak, & Wisham, 2007).

The consequences of childhood obesity have immediate and long-term effects on children. Obesity associated cardiovascular disease risk factors usually present in obese adults manifest early in obese children. Data from the Bogalusa Heart Study showed that approximately 60% of overweight 5 - 10 year olds had one cardiovascular risk factor, such as high blood pressure, hyperlipidemia, or elevated insulin levels. From the same study, over 20% of overweight children had two or more cardiovascular risk factors (Deckelbaum & Williams, 2001). Approximately 13% of overweight children have elevated systolic blood pressure and approximately 9% have elevated diastolic blood pressure (Barlow, 2007).

The effects of obesity stretch beyond cardiovascular risks. Type II diabetes mellitus is one of the most serious complications of childhood obesity. Historically, type I diabetes was diagnosed in childhood, while type II was diagnosed in adulthood and associated with obesity and inefficient insulin utilization or excretion. This trend has changed in recent years with 45% of newly diagnosed diabetic children having type II, rather than type I diabetes (Barlow, 2007).
Incidence of gastrointestinal disorders, such as nonalcoholic fatty liver disease (NAFLD) and gallstones are significantly increased in obese and overweight children compared to normal weight peers. Obese children also report more fractures and muscular skeletal discomfort. Childhood Obesity is a strong predictor for adult obesity, leading to exacerbating chronic diseases with complications and co-morbidities likely to persist throughout the lifespan (Barlow, 2007; Dementia & Denney, 2008). According to Dementia and Denney (2008), if a child is obese by age 4, he is 20% more likely to be overweight as an adult. If the child is overweight by adolescence, he is 80% more likely to be obese as an adult.

The economic impact of obesity is significant. As the number of children who develop chronic diseases increase, the utilization of health care resources will increase. Annual hospital dollars related to childhood obesity increased from $35 million in 1981 to $124 million dollars in 1999 (Demmatia & Denney, 2008).

Finkelstein’s 2008 statistical analysis of national data indicated that overweight and obesity accounted for 9.1% of national health spending. Since Medicaid covers approximately half of these increased costs, increases in childhood obesity will place further strain on national health care spending.

Wang and Dietz (2002) assessed discharge records and used obesity as the secondary hospital diagnosis to estimate the costs of hospital care for obese children. They found prolonged hospital stays and increased inpatient costs with an obesity related diagnosis. A better understanding of the impact childhood obesity has on national economic expenditures will help guide the best approach to prevention and treatment of childhood obesity.
Obesity is defined as a Body mass Index (BMI) greater than age and sex specific 95\textsuperscript{th} percentile of the 2000 CDC growth charts. Overweight is defined as greater than the age and sex specific 85\textsuperscript{th} percentile (Center for Disease Control, 2010).

Poverty cannot be defined by a single criterion. The United States Census Bureau uses a set of money income thresholds that vary according to family size and composition to determine who is in poverty. If a family’s size adjusted total income falls below standard thresholds determined by the U.S Census Bureau, the family is living in poverty (Anderson, 2011). Poverty thresholds are also adjusted for cost of living using the Consumer Price Index. According to the U.S. Census Bureau, in the 36 month period from January 2004 to December 2006, 28.9\% of the U.S. population was in poverty for at least two months. More than 1.1 million children joined the impoverished population between 2009 and 2010. In 2010, more than 1 in 5 children (15.75 million) lived in poverty in the United States (United States Census Bureau, 2011a; United States Census Bureau, 2011b). Figure 1 illustrates the progressive increase from 1979 to 2011 of children living in poverty.

Standard poverty levels can help further define a family’s degree of poverty. A percentage is used to describe family income above or below the designated poverty level. For example, 150\% below the poverty level is defined as a family’s income of one and one half times below the designated monetary amount.

According to the Vermont Department of Health, prevention is defined as “the promotion of constructive lifestyles and norms, and is achieved through the application of multiple strategies; it is an ongoing process that must relate to each ongoing generation” (Vermont Department of Health, 2011, p. 1)
Given the disproportionate number of children living in poverty who are obese, the purpose of this paper is to examine interventions to prevent childhood obesity specific to children living in poverty.

**Theoretical Framework**

Ecological Systems Theory (EST) states that an individual’s ecological niche must be taken into consideration when making changes to the person’s health. (Bronfenbrenner, 1994) (Demmatia & Denney, 2008) University of Albany and Pennsylvania State University researchers Davison and Birch (2001) developed the Ecologic Model of Childhood Overweight to focus specifically on the multiple environmental factors that affect children’s weight (Figure 2). A child’s weight status is directly influenced by individual risk factors, which are influenced by familial and societal characteristics. Family characteristics include parenting styles, family structure and composition, maternal feeding choices, and parental exposure to healthy lifestyles. Individual characteristics include genetic factors, habits, coping strategies, interests, and motivation. Societal characteristics include neighborhood demographics, school and community influences, and economic barriers. Ecological Systems Theory of Childhood Overweight takes into consideration the child’s weight related to multiple environmental factors, addressing the combined effects of family, societal, and individual factors that contribute to childhood obesity (Davidson & Birch, 2001).

**Methods**

A literature review was conducted using the Washington State University Library Link EBSCO host and the advanced search options of CINHAHL and Google Scholar were used. Key words for these search strategies were “poverty”, “childhood obesity”, and “prevention”, yielding over 1000 resources related to poverty and childhood obesity. Extracted studies
included concept analysis, research studies, literature reviews, professional practice guidelines, and government based statistical reports. Search parameters were then narrowed to include peer reviewed, articles written in English, and current resources, which yielded 31 articles and websites. The research problem for review was guided by the theoretical framework, The Ecologic Model of Childhood Overweight, and required analyzing the literature for successful prevention strategies in children ages 2-13 living in poverty. Interventions compatible with the theoretical framework focused on the familial, societal, and individual factors that contribute to childhood obesity.

**Literature Review**

**Familial Factors Contributing to Childhood Obesity**

Family is an essential source of positive and negative influence on children and the primary source of exposure to healthy habits. Social and interpersonal support provided by the family is essential in shaping and maintaining children’s eating and physical activity patterns (Gruber & Haldeman, 2009, p. 1). Healthy eating and activity behaviors learned in childhood carry over to adulthood, thus it is essential to initiate family centered prevention of childhood obesity.

Successful behavior change incorporating the family unit was demonstrated in a study conducted by Tyler and Horner (2008). The qualitative study (n=35 families) was the first phase of a family-centered intervention program that included all family members collaborating as a team to assess current family barriers to healthy weight over a period of nine weeks. Children included in the study were obese, defined as >95th percentile for age and gender and >130% of the poverty level. The study was a process evaluation of the interventions being tested by an ongoing longitudinal study, entitled the Children’s Health and Weight Study (CHeWS) (Tyler &
Homer, 2008). A goal of the program was to empower parents to help manage their children’s obesity thru collaboration with the parent, child, and primary care provider at the clinic. Family members were encouraged to critically think through family specific barriers. Limited accessibility to healthy foods and the inability to exercise in safe play areas were two barriers expressed by families. Participating families generally made progress toward initial goals of weight management, but most importantly parents were provided with necessary parenting skills to help their child with healthy weight management techniques.

Margrey et al (2011) conducted a single blinded, randomized study that targeted parenting skills as a factor to positively influence a family’s lifestyle changes. Participants (n=169) were randomly assigned to a parenting skills, plus healthy lifestyle group or a healthy lifestyle only group. The parenting skills, plus healthy lifestyles group focused on teaching parents problem solving skills in respect to lifestyle changes, as well as traditional nutritional and activity information. The healthy lifestyle group focused only on the traditional information. Both groups had a 10% weight reduction over 18 months; however the parenting skills plus healthy lifestyles group had a more rapid weight loss over time. Limitations of the study were the parenting skills were not specific to obesity management. The significant finding of this study was both groups enlisted parent involvement and education about healthy lifestyle changes. By involving parents in a weight loss plan, a reduction in BMI was achieved.

Family structure and composition influence family behaviors. Research suggests that structured family rules, positive parental and sibling involvement, and constructive emotional support are linked to healthy family behaviors and healthy lifestyle choices (Gruber & Haldeman, 2009). Family structure, for example the number of parents or number of siblings, affects childhood obesity. A secondary data analysis of data from the Early Childhood
Longitudinal Study-Kindergarten Cohort (ECLS-K) was performed by Chen and Escarce to examine the effect of family structure on childhood obesity. BMI and family structure were gathered from the kindergarten, third, and fifth grade records of children (n=17,565). Significant variables included in the analysis were family income, categorized as poor (<100% of poverty level), low-income (100-199% of poverty level), middle-income (200-399% of poverty level) or high-income (more than 400% of poverty level), and mothers education, categorized as high school or less, high school graduate, some college, and bachelors degree or higher. Family structure, income level, and education level were associated with higher obesity rates. Children from single mother families had higher rates of obesity than children from two parent families in every grade. Mothers income level was a significant factor in children’s obesity (25% of families with high school or less education had an obese child, compared to 17% for college degree or higher.) In addition, more poor children (24%) were more obese than children from high income families (16%).

Mothers have early influence on the future weight of their children. Overweight infants are at increased risk to become overweight toddlers, adolescents, and adults. The risk of obesity was reduced by 4% per month of breastfeeding up to nine months (Harder, Bergmann, Kallischnigg, & Plagemann, 2005). However, breastfeeding rates are lowest among socioeconomic disadvantaged mothers compared to higher income mothers. Statistics from the Centers for Disease Control indicate that 74% of all women from all socioeconomic levels initiate breastfeeding, where as 67.8% of women enrolled in the Women Infant, and Children nutritional supplement program (WIC) initiate breast feeding. At six months, 43% of women continue to breastfeed, whereas only 33.7% of WIC-enrolled mothers continue to breastfeed (Center for Disease Control website, August 2011). According to Hurley, Black, Papas, and
Quigg (2008), reasons for breast feeding cessation among low-income women included breastfeeding difficulty, pain, insufficient milk supply, and the infant rejecting breastfeeding.

Breastfeeding duration can be extended among low-income women with structured follow up education as demonstrated by a 2008 study of low-income women (n=328) in the Baltimore, Maryland region (Pugh et al., 2010). Participants were eligible for the 24-week study if they were enrolled in the WIC program. Breastfeeding women were assigned to an intervention group or a usual care group. The intervention group received home visits, phone follow up, and 24-hour pager support by a breast feeding support team comprised of nurses and peer counselors. The intervention group had a higher breast feeding rate at 6 weeks (66.7%) and 12 weeks postpartum (49.4%) compared to the usual care group (56.9% and 40.6%).

Family has a profound influence on childhood obesity. Family structure, parenting skills, and education level influence childhood obesity in low income families, and should be taken into consideration in obesity prevention and treatment programs.

**Societal Factors**

Childhood obesity prevention should be approached as a public health problem, incorporating community resources in preventative efforts. School-based nutrition and activity programs can significantly reduce childhood obesity as demonstrated by a randomized study of low socioeconomic status children (n=450) in a school-based intervention program integrating healthy eating education with physical activity (Wang et al., 2005). The project was called Healthy Eating and Active Lifestyles from School to Home for KIDS (HEALTH-KIDS). It tested the feasibility of delivering school-based interventions to target population of high-risk children at four middle schools (grades 5-7). More than 80% of the participants were African American and greater than 70% of the students were from low-income families. A community
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focus group comprised of local grocery store owners, principals, teachers, and parents helped identify and understand barriers to healthy eating and activity. The focus group helped establish the study’s overall goals: a) emphasizing the importance of enriching the school environment; b) establishing community support and environment modifications; and c) incorporating a family support program.

Interventions included improvement of school food service (since greater than 90% of the students qualified for free or reduced lunches), and implementing school fun programs, such as *Walk to School* days and “*TV Turn off Week*”. A community-based intervention utilized in the study was to help small grocery stores obtain fruits and vegetables at reasonable prices so families had access to healthy food options. Parents were asked to track and promote healthy lifestyle changes at home. Although the study is still in progress, the researchers are highly encouraged by the positive involvement and support of the community, parents, teachers, and children. Preliminary data indicated that school based intervention programs are essential for children of low-economic status (Wang et al., 2005). The study concluded in 2006, but the results are not published.

Unsafe neighborhoods are a barrier to healthy lifestyles for families and children of low-socioeconomic status. Although physical activity is an essential element in obesity prevention, unsafe neighborhoods make it difficult for children to increase their physical activity in low income families (Burdette & Whitaker, 2005). A mother’s perception of neighborhood is safety can affect her children’s physical activity. Burdette and Whitaker (2005) used a cross sectional survey to test the hypothesis that 3 year old preschool children (n=3141) who live in neighborhoods perceived as unsafe by mothers play less outside, watch more television, and subsequently have a higher rate of obesity. When mothers perceive their neighborhood unsafe,
then their children watched 201 minutes of television per week compared to 185 minutes per day among children of mothers who perceived their neighborhoods as very safe. The relationship between television viewing and neighborhood safety are significant, with children in the least safe group watching approximately 10% more television per day than other groups with safer neighborhood. Results of this study should be interpreted carefully since obesity and increased BMI do not begin to significantly manifest until age seven (Hedley et al., 2004).

A cross sectional population of parents of 7-year old children (n=768) taken from the National Institute of Child Health and Human Development Study of Child and Youth Development were surveyed to assess neighborhood safety among low income mothers and the relationship to increased BMI. The survey asked specific questions on individual neighborhood safety. Numerical scores were applied to the questionnaire items with 0 indicating the least safe and 5 indicating the safest. Data were gathered at age 4.5 and first grade to assess parent income, education level, parent’s perception of neighborhood safety, and the child’s BMI. Researchers found 17% of overweight children had parental scores of 0-2 (least safe perception); 10% in the middle safety category with scores of 3-4 and 4% in the safest category with scores of 5+ (Lumeng, Appugluise, Cabrel, Bradley, & Zuckerman, 2006).

Finding alternative venues for exercise and activities is a necessary intervention for children living in unsafe neighborhoods. The Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity suggest providers advocate for children who live in unsafe neighborhoods by encouraging utilization of community centers and indoor exercise programs like mall walking (Barlow, 2007).

The economics of childhood obesity is essential in understanding the relationship between childhood obesity and poverty. Data from the Bureau of Labor Statistics indicate that
income affects quality of diet. Food purchases made by high income families greatly differed from those made by low-income families because a healthy diet generally costs more (Kaufman, McDonald, Lutz, & Smallwood, 1997).

A 2004 study of food consumption assessed individual foods (n=372) according to their nutrient/energy density, expressed as $/1000 kcal. Fats, sugars, and oils provided the greatest energy density and lowest nutrient density at the lowest cost at $1.76/1000 kcal. Fish, fruits, and vegetables provided the lowest energy, greatest nutrient density, and highest prices at $18.16/1000 kcal (Monsivais & Drewnowski, 2007). Wealthier consumers can afford a higher quality, healthier, and more varied diet with more fruits and vegetables than lower income consumers who tend to select lower cost meats, inexpensive grains, and refined sugars (Drewnowski & Darmon, 2005, p. 265). These economic factors help explain why low income persons are more obese and restricted to the diet they can afford.

Individual Factors

A child’s genetic predisposition is a factor to consider when developing obesity prevention interventions for children living in poverty. Evidence indicates that obesity among low-income children is associated with maternal obesity during pregnancy. This relationship is unfortunate, because the U.S. Department of Health and Human Services reports obesity rates among impoverished women as 50% higher than women of higher socioeconomic status. The link between maternal obesity and childhood obesity was demonstrated in a study of families (n=101) over a one month period at a Pediatric Nutrition Clinic. The survey assessed BMI of each family member, activity level, and nutrition. Among all the variables included in the analysis, maternal obesity was the strongest independent predictor (71% sensitivity) of childhood obesity (Arluk, Branch, Swain, & Dowling, 2003).
Whitaker (2004) conducted a retrospective cohort study of low income children (n=8494) enrolled in the WIC program who were followed from the first trimester of gestation to 24 and 59 months of age. Maternal BMI was measured during early pregnancy, and the children’s BMI was measured at 2, 3, and 4 years. By 4 years of age, 24.1% of children were obese if their mothers had been obese in the first trimester of pregnancy, compared to 9.0% of children whose mothers had been of normal weight. After controlling for variables, such as race, ethnicity, education level, marital status, parity, weight gain, and smoking, the relative risk of childhood obesity associated with maternal obesity in the first trimester of pregnancy was 2.0 at 2 years, 2.3 at 3 years, and 2.3 at 4 years. Therefore, among low income children, maternal obesity in early pregnancy more than doubles the risk of obesity at 2 to 4 years of age (Whitaker, 2004). According to the U.S. Department of Agriculture, approximately 50% of families with infants meet the financial requirements for WIC. Nearly one third of women enrolled in WIC were already obese when they conceived (Cole, 2001). Strategies to prevent childhood obesity in low income children should begin with pre-conception and first trimester counseling.

Gestational diabetes is a maternal risk factor associated with a genetic predisposition towards childhood obesity (Lawlor, Lichtenstein, & Langstrom, 2011). The link between gestational diabetes and obesity is significant, with 47% of diabetic women having a body mass index greater than 30 kg/m, compared to 25% of all women. Impoverished women of childbearing age, (25-44 years), have twice the risk of diabetes than more affluent women (Centers for Disease Control and Prevention, 2011). Gestational diabetes is associated with increased fetal adipose tissue, because of high glucose loads in utero (Lawlor et al., 2011). Maternal insulin does not cross the placenta, so fetal insulin excretion increases, resulting in
rapid fetal growth. Increased glucose loads, coupled with an early increase in fetal insulin excretion, are believed to contribute to the development of childhood obesity.

**Discussion**

The increasing prevalence of childhood obesity in the United States has been well established from preschool through adolescence. Although increases in childhood obesity are occurring across every ethnic and socioeconomic line, some groups are affected more profoundly than others. Children living in poverty require special considerations when developing plans for prevention of childhood obesity. Familial factors, societal, and individual factors play a significant role in influencing childhood obesity among impoverished children. Clearly, prevention of childhood obesity for families living in poverty begins with maternal health. Gestational diabetes and maternal obesity affect the health of the fetus and subsequent growth and development of the child. Family influence on nutrition and exercise is important to consider when developing interventions to prevent childhood obesity. Societal factors may present further risks for families living in poverty. Unsafe neighborhoods, limited access to healthy foods, and well intentioned, but poorly executed social welfare and school lunch programs contribute to increased obesity risk for children living in poverty.

Collaboration between the child, parent, and community resources is essential in preventing and treating childhood obesity in impoverished families (Tyler & Horner, 2008). When assessing the home food environment, the practitioner needs to consider the availability of nutritious high energy foods in the home. Parental feeding habits, as well as financial access to healthy foods should be assessed as a contributing factor to childhood obesity (Drewnowski & Darmon, 2005). The literature discusses involving community stakeholders, such as schools and small businesses in developing long-term prevention strategies to include diet and exercise
programs (Wang et al., 2005). Genetic predisposition to obesity begins with maternal health pre-conception and throughout pregnancy. Providing adequate maternal education on managing gestational diabetes to prevent large for gestational age infants and reducing concomitant risk of future obesity is an important step in childhood obesity prevention.

**Significance for Nurse Practitioner Practice**

A 2005 survey of 99 family nurse practitioners and pediatric nurse practitioners revealed 73.7% of respondents were aware of American Academy of Pediatrics (AAP) childhood obesity guidelines, and were teaching parents to promote healthy nutrition and activity. Of those aware of the guidelines, only 57.6% reported following the guidelines. Yearly body mass index (BMI) calculation is currently recommended by the AAP and CDC. However, 49% of Nurse Practitioners never or rarely measured BMI, while only 9% always calculated BMI (Larson, Mandleco, Williams, & Tiedeman, 2005). Knowledge of current guidelines and adherence to recommendations are the first steps in preventing childhood obesity.

The literature presents important considerations for the Nurse Practitioner’s clinical approach to childhood obesity. It is essential for Nurse Practitioners to adopt effective childhood obesity prevention strategies in their practice of pediatrics. In a survey conducted by Larson, et al (2005), 58.8% of the Nurse Practitioners never or rarely monitored children of low socioeconomic status with special consideration for childhood obesity. Children with risk factors, such as poverty and parental obesity are at increased risk for obesity and a lifetime of potential chronic diseases such as diabetes and cardiovascular disease. Awareness of the importance of maternal health, home food environment, and familial and community impact on prevention will better equip the Nurse Practitioner to develop a patient-centered plan for the clients at risk for developing childhood obesity. Incorporating food education strategies, parental
involvement, and community resources are key factors for the Nurse Practitioner to consider when developing a treatment plan for the low-income child. Nurse Practitioners must recognize both the impact of childhood obesity on the health of future generations and the influence of low-income on childhood obesity, if prevention strategies are to be effective. Figure 3 represents a summary of prevention strategies for nurse practitioners to reference.

Recommendations for Future Research

Future research should focus on examining the impact of social programs, such as WIC, National School Lunch Program, and food stamps on childhood obesity. Schools can have a pivotal role in providing needed nutrition education and physical activity to children of all socioeconomic levels. Identifying policy influences on childhood obesity is an important first step to understanding contributing factors to childhood obesity. Limiting marketing of fast food and providing tax incentives for low-income neighborhood grocery stores to provide fresh fruits and vegetables may also be effective strategies. Utilizing longitudinal study designs to assess the effectiveness of interventions from early childhood thru late adulthood, and possibly across generations, is another research need. Randomized, controlled investigations on the significance of maternal health and gestational diabetes on childhood obesity is also lacking in the literature. Finally, assessing intervention outcomes to guide the development of clinical practice guidelines is an essential and ongoing need for effective prevention and treatment of childhood obesity.

Conclusion

Recognizing impoverished children as high risk for childhood obesity is essential for the nurse practitioner. Factors contributing to obesity in low-income children are familial, societal, and individual. Initiating family-centered interventions for children living in poverty is important for successful behavior modification of healthy lifestyle choices. Assuring maternal
health pre-conception and throughout pregnancy can reduce the incidence of childhood obesity. Collaboration with schools and community resources to assure that healthy foods and physical activity choices are available to impoverished children is central to planning successful interventions. Nurse practitioners have the opportunity to recognize impoverished children as high risk for childhood obesity and subsequent obesity in adulthood. By recognizing the child at risk and implementing preventative strategies, the long-term health of impoverished children will be improved.
References


Appendix

Figures
Figure 1. Poverty Rates for Total U.S. Population and Children 1979-2010

Figure 2. Ecologic Systems Theory of Childhood Overweight

Figure 3. Summary of Strategies for Prevention of Childhood Obesity in Impoverished Children

Effective Childhood Obesity Prevention Strategies for Nurse Practitioners:

- Assure optimal maternal health prenatally and throughout pregnancy
- Encourage breast feeding for one year.
- Engage community leaders and organizations to help in prevention and intervention programs in your community
- Include parents and siblings in education and goals for healthy lifestyle choices