Overview of Early Childhood Obesity and the NCIOM Early Childhood Obesity Prevention Task Force

Chapter 1

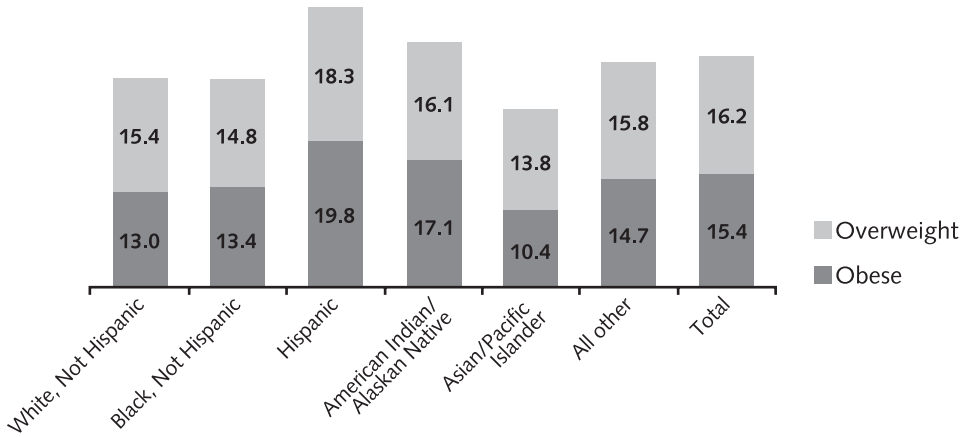
Call to Action

The prevalence of obesity nationwide has increased dramatically over the past two decades.[1] One in three (35.7%) adults in the United States is obese.[2] In North Carolina the proportion is similar, with 29.1% of the adult population obese in 2011 and an additional 36.0% overweight.[3] However, obesity is not a health condition limited to adults or older children. Young children, ages 0-5 years, are not immune to obesity or the various factors that increase the risk for obesity. In fact, 1 in every 10 preschool-aged children in the United States was obese in 2010.[4]

The North Carolina Pediatric Nutrition Surveillance Survey, which collects data on low-income children ages 0-5 years, shows that the obesity epidemic affects even the youngest individuals in the state. Over the past 30 years, the obesity rate has more than doubled among young children ages 2-4 years, rising from 6.9% in 1981 to 15.4% in 2011. The percentage of overweight children in this age group also increased during this time, from 11.7% in 1981 to 16.2% in 2011.[4] Roughly 3 out of every 10 (28.5%) low-income young children ages 2-4 years are either overweight or obese in North Carolina.[5] North Carolina Pediatric Nutrition Surveillance Survey data from 2011 show that a greater percentage of Hispanic children ages 2-4 years are obese (19.8%) compared to white children (13.0%) and black children (13.4%).[5]

Roughly 3 out of every 10 (28.5%) low-income young children ages 2-4 years are either overweight or obese in North Carolina.

Figure 1.1
Percentage of Overweight and Obese Children Ages 2-4 by Race and Ethnicity



Source: NC Pediatric Nutrition Surveillance System, 2011.[a]

a Analyses based on one record per child. Reporting period is January 1 through December 31. Excludes records with unknown data or errors. Based on 2000 CDC growth chart percentiles for children 2-20 years of age; overweight is defined as BMI-for-age >= 85th to < 95th percentile, and obesity is defined as >= 95th percentile.

One caveat to these data is that that they are from children in low-income families. There are no data available at the state level of obesity prevalence for children of higher incomes. Using data from the National Health and Nutrition Examination Survey, cross-sectional analyses of children ages 2-5 years of all incomes showed that a greater percentage of black children were obese (18.9%) versus 16.2% of Hispanic children and 9.2% of white children in 2009-2010.[6] These data indicate that, on a national level, both black and Hispanic children ages 2-5 are at greater risk of being obese.

Children who are overweight or obese are more likely to develop obesity in adolescence or adulthood.[7] The lifelong impact of childhood obesity on health is significant and includes, among other things, a higher risk of chronic disease. Thus, it is important to intervene early in a child's life to prevent overweight and obesity.

For children ages 2-19 years, individual BMI scores are compared to those of other children of similar age and gender to account for children's changing body compositions.

The good news is that there are evidence-based and evidence-informed strategies that can make a difference. It is time to implement such strategies in North Carolina to improve the health of our young children ages 0-5 years in order to prevent the significant immediate and lifelong health consequences of overweight and obesity. This blueprint not only serves as a roadmap that can help us prevent overweight and obesity for young children, but it is a call to action. There is a role for everyone to play in ensuring a healthy start for our youngest children. By working together collectively and implementing multiple strategies simultaneously, we can promote healthy weight and instill positive health behaviors in young children. Positive health behaviors learned in childhood—including healthy eating and increased physical activity—can serve as the basis for a lifetime of healthy behaviors.

Defining Obesity

While the word "obesity" and derivations of it are casually used by the general population, they are actual technical terms used by health care, public health, and medical professionals (among others) to describe a specific body weight status. Obesity is defined differently based on age categories. For individuals ages 2 years or more, an individual body mass index (BMI) is calculated using the following formula: BMI = weight^2/height^2 , where weight is measured in kilograms and height is measured in meters.[1,8] An adult aged 20 years or more whose BMI is 18.5-24.9 is considered to be at "normal" weight, one whose BMI is 25-29.9 is considered "overweight," and an adult's whose BMI is 30 or greater is considered "obese."[9] For children ages 2-19 years, individual BMI scores are compared to those of other children of similar age and gender to account for children's changing body compositions (i.e. body fat differs between girls and boys, and the amount of body fat changes with age) using the Centers for Disease Control and Prevention's Growth Chart (see Appendix A).[9] The percentile ranking indicates the child's weight category. A child whose weight falls in the range of the 5th to the 84th percentile is considered "healthy weight," one whose weight falls in the range of the 85th to the 94th percentile

is considered "overweight," and a child whose BMI is at or above the 95th percentile is considered "obese."

The weight status of children from 0-under 24 months is best determined using the World Health Organization (WHO) Child Growth Standards in Appendix B, which is the clinical practice recommended by the CDC. The WHO Child Growth Standards are recommended because these standards show how children *should* grow, not how they *do* grow. It is important to note that these standards are based upon data from infants in six countries (including the United States) who were optimally nourished, and these standards use the breastfed infant as the standard for growth.[10,11]To use these standards, the weight and length of a child are plotted on the gender-appropriate growth chart. A child or infant whose weight-for-length is higher than the 98th percentile is considered to have abnormal growth and is said to have high weight-for-length.

Recent research showed that children who gained enough weight to increase their BMI percentile by 10 or more percentage points before age 2 (i.e. moved up 2 or more weight-for-length percentiles, e.g. from the 75th to the 85th percentile or from the 50th to the 60th percentile) had increased odds of being obese at 5 and 10 years of age. Interestingly, the prevalence of obesity was highest in those children who went up 10 percentage points in the first 6 months of life.[12]

The evidence clearly shows that obese children are more likely to become obese adults.

Health Consequences of Early Childhood Obesity

The rise in overweight and obesity is alarming, especially because of the potential health consequences. Complications of overweight and obesity can negatively affect most organ systems including the circulatory, cardiovascular, skeletal, respiratory, reproductive, and digestive systems. People who are overweight or obese are more likely to develop type 2 diabetes, high blood pressure, heart disease, and certain cancers, and are also at a higher risk for stroke.[13] Other complications stemming from overweight and obesity include high cholesterol, sleep apnea, osteoarthritis, liver and gall bladder disease, and gynecological problems.[9] Many of these problems affect both adults and children.

The evidence clearly shows that obese children are more likely to become obese adults. According to a longitudinal study of approximately 1,000 children, children who were overweight at ages 24, 36, or 54 months were 5 times more likely to be overweight at age 12 years than children who were not overweight at those ages.[14] Another study of about 800 individuals found that obese children over the age of 6 have a greater than 50% probability of becoming obese adults compared to a 10% probability for non-obese children.[15] Along with this increased risk of being an obese adult comes the increased risk of a multitude of concomitant health problems such as those mentioned above.

Aside from the risk of obese children becoming obese adults, there are more immediate, short-term health impacts of early childhood obesity as well. The majority of studies about the adverse health impacts of obesity in children are

from studies with older children; however, there are some studies showing the health impacts of obesity in children 0-5 years.[16,17] Furthermore, for children ages 0-5 years who are overweight or obese, the increased risk of being overweight later in childhood puts these children at greater health risk.[18-21] Childhood obesity has been associated with serious comorbidities even among young children. A 1999 study in the journal Pediatrics showed that nationally, 65% of obese 5- to 10-year-old children have at least one cardiovascular disease risk factor, and 25% of obese 5- to 10-year-olds have two or more risk factors.[22] In the 2007 report of the Bogalusa Heart Study, almost 70% of obese children ages 5-14 years had at least one additional risk factor for cardiovascular disease, such as elevated cholesterol, insulin, or blood pressure.[23] It has also been shown that children who are obese are at increased risk for other health conditions including sleep apnea, bone and joint problems, and social and psychological problems.[24] Childhood obesity also contributes to type 2 diabetes in children. Type 2 diabetes, once uncommon among children, has been trending upward for the last two decades. This upward trend may be attributable to the rising obesity rates among youth (as well as low physical activity levels).[25]

Lifestyle factors, the environment, family history, and genetics are among the many factors that affect individual weight status.

Preventing Early Childhood Obesity

Obesity has many causes. Lifestyle factors, the environment, family history, and genetics are among the many factors that affect individual weight status. The most common root cause of obesity is an energy imbalance caused by the consumption of more calories than needed (e.g. for basic body processes such as cellular respiration) or more calories than expended (e.g. through regular daily activities and bouts of physical activity).[26]

While this most common underlying cause (energy imbalance) of obesity is well-known and accepted, simply advising people to "eat right" or "be more active" has not been sufficient to address the obesity epidemic. Because of obesity's multifactorial nature, there are many potential strategies and opportunities to reduce and prevent obesity. Multifaceted interventions that use the socioecological model of health to target interventions at the interpersonal, clinical, community, environment, and policy levels, have a far greater likelihood of improving population health than any single intervention.[27]

Obesity prevention and intervention starts with the family *before* the child is born. Children under 10 years old who have obese parents are more than twice as likely to be obese adults as their counterparts.[28] Therefore, maintaining healthy weight is important for parents. In addition, pregnant women and women considering pregnancy should understand the importance of healthy weight gain during pregnancy, as babies born to obese mothers have a greater chance of being obese later in life.[29]

The behaviors of parents, caregivers, and families influence children throughout childhood. Cultural differences in the perception of healthy weight for young children may influence a parent or caregiver's receptivity to changing what the

child eats or how much exercise he or she receives.[30,31] Role modeling, such as being physically active and practicing healthy nutrition behaviors, is integral to a child's lifestyle, education, and practice of these behaviors. Communities, schools, child care settings, health care providers, and others play an influential role in the nutrition and physical activity behaviors of children as well.[24] The characteristics of both the built environments and nutrition environments where children live and play, such as access to spaces that welcome and encourage physical activity and access to healthy foods, also significantly impact children's activity levels and eating habits.[32] As discussed in Chapter 4, child care settings offer a high-impact intervention point for altering the nutrition and built environments of young children to improve access to healthy food and places to be active.

Child care programs provide an optimal location for intervention.

It is important for children's growth to be monitored and for adjustments to be made to help children achieve or maintain a healthy weight. Protective factors for healthy weight include age-appropriate sleep duration, healthy eating and nutrition, and physical activity.[33] Meals eaten away from home are a growing part of the American diet; however, these types of meals have been shown to have higher caloric value, larger portion sizes, and lower nutritional quality, underscoring the value of eating healthy meals at home.[34-36] Sedentary behaviors also contribute to the obesity epidemic; studies show that the more television children watch, the greater their risk for obesity.[37-41] Other forms of "screen time" such as computers and video games also contribute to obesity because these activities displace calorie-expending physical activities.[42] Short sleep duration has also recently been included in the risk factors for childhood overweight.[43]

Many young children spend a significant amount of time away from home. At any point in time, approximately 1 in 4 (25%) children ages 0-5 years is attending a child care program in North Carolina.[44] An even greater percentage of children in this age category spends some time in child care programs. Therefore, child care programs provide an optimal location for intervention. The faith community and other community settings may also play a significant role in helping to prevent and address early childhood overweight and obesity. By encouraging protective factors such as healthy eating, nutrition, and adequate physical activity, community organizations can become advocates for healthy weight and healthy children.

Many national and state organizations have studied the issue of childhood obesity and have developed recommendations for prevention and reduction of this public health problem. Chapter 2 of the report presents the recommendations from these groups that relate to preventing early childhood obesity in children ages 0-5 years.

Existing Recommendations for Preventing Early Childhood Obesity

There have been a number of task forces at the national and state levels that have recommended evidence-based or evidence-informed strategies to reduce obesity in children. Evidence-based strategies are often defined somewhat differently by different groups and, therefore, should be viewed as part of a continuum in this report. On one end sit the evidence-based strategies that are considered the "gold standards," which are supported by rigorous, systematic review. These are strategies that have "reach, feasibility, sustainability, and transferability." On the other end of the evidence-based strategies continuum sit emerging and promising practices, which are evidence-informed. These strategies appear to be effective based upon field-based summaries or evaluations in progress.[45] In this report, both of these terms will be used. Evidence-based strategies will refer to the strategies with the strongest evidence, while evidence-informed will refer to those strategies that are at the emerging or practice level.

Six national and state-level groups have developed recommendations, to prevent or reduce childhood obesity over the past decade.

At least six national and state-level groups have developed recommendations, based on evidence-based and evidence-informed strategies, to prevent or reduce childhood obesity over the past decade, including the Institute of Medicine of the National Academies (IOM) Early Childhood Obesity Prevention Policies Committee (2011),[46] the White House Task Force (WHTF) on Childhood Obesity (2010),[47] the North Carolina Legislative Task Force on Childhood Obesity (2010),[48] the North Carolina Division of Public Health (DPH) (2010),[49] the North Carolina Institute of Medicine (NCIOM) Prevention Task Force (2009),[50] and the North Carolina Health and Wellness Trust Fund Commission (NC HWTF) Study Committee on Childhood Obesity (2005).[51] On the national level, there have been two major initiatives aimed at reducing childhood obesity. First, in 2010, the White House completed a report on early childhood health and examined strategies to reduce early childhood obesity. Then, in 2011, the Institute of Medicine of the National Academies reviewed factors related to overweight and obesity from ages 0-5 years, with a focus on nutrition, physical activity, and sedentary behavior, and recommended actions that health care professionals, caregivers, and policymakers can take to prevent obesity among children in this age group.[46]

The recommendations from the above bodies identified evidence-based or evidence-informed strategies to prevent or reduce childhood obesity. While many of the recommendations focused on school-aged children, there are evidence-based and evidence-informed strategies that can also be implemented to improve the weight status of younger children. In general these recommendations fall into eight categories and include prenatal care, breastfeeding, growth monitoring, sleep, healthy eating behaviors and nutrition, screen time, and physical activity. The last category is referred to as "general" and consists of recommendations that are more crosscutting or broad in nature.

The NCIOM Early Childhood Obesity Prevention Task Force relied on the work

of other task forces and committees that had already put forth the effort to identify evidence-based and evidence-informed strategies. Since the time those reports were published, the strength of the connection between breastfeeding and obesity prevention has been shown to be potentially weaker than previously thought. Results published in *JAMA* (March 2013) from a clinical trial of nearly 14,000 mother-infant pairs found that breastfeeding duration and exclusivity did not prevent overweight or obesity in children. While this is just one study, it was a randomized controlled trial and suggests the link between breastfeeding duration and exclusivity and obesity prevention is less clear.[52] Recent reviews of the literature also suggest that while breastfeeding may offer a modest protective effect, it is no longer considered as major a determinant for healthy weight in children.[53,54] However breastfeeding does provide known benefits for babies, such as improved cognitive development and protection against infection, type 2 diabetes, and asthma.[55] Breastfeeding is also associated with decreased risk for maternal diabetes and maternal cardiovascular disease.[56-58] The NCIOM Task Force on Early Childhood Obesity Prevention elected to retain the work it had done in developing strategies to implement the breastfeeding-related recommendations from the other task forces and committees for two reasons: 1) a modest protective factor may in fact exist and future scientific research will help elucidate the association, if there is one, and 2) the many known benefits of breastfeeding to infants and their mothers are clear and consistent.

The Task Force was charged to developing a blueprint to prevent or reduce early childhood obesity in North Carolina.

NCIOM Task Force on Early Childhood Obesity Prevention

At the request of the Blue Cross and Blue Shield of North Carolina Foundation (BCBSNC Foundation), the NCIOM convened a task force to develop a multifaceted plan to prevent and reduce early childhood obesity. The NCIOM Task Force on Early Childhood Obesity Prevention (ECOP) was a collaborative effort between the BCBSNC Foundation, the North Carolina Partnership for Children (NCPC), and the NCIOM.

The ECOP Task Force was charged with:

1. Examining evidence-based and evidence-informed strategies from prior North Carolina and national task forces that focus on reducing childhood obesity.

2. Developing a blueprint to prevent or reduce early childhood obesity in North Carolina.

A specification for the blueprint was that it needed to include specific strategies for action, partners, and resources necessary to implement the recommendations of prior state and national task forces that have examined evidence-based and evidence-informed strategies for preventing or reducing early childhood obesity. In addition, the blueprint included performance measures to ensure that the strategies, as implemented, were achieving their intended purposes.

The ECOP Task Force recognized that there was no single intervention that can "solve" the problem of early childhood overweight and obesity. Rather, multilevel interventions are needed at the clinical, community and environment, and policy levels to support behavioral change. To ensure that the ECOP Task Force included a broad cross-section of stakeholders and experts, the ECOP Task Force consisted of four different workgroups. One workgroup, referred to as the "core group," consisted of 19 ECOP Task Force members who were requested to attend all topic group meetings. This smaller core group included representatives of the BCBSNC Foundation and NCPC as well as other key stakeholders such as representatives of state and local agencies, health professional associations, foundations, and consumer groups. In addition, we also invited other stakeholders and content experts to participate in the three other workgroups which focused on either clinical, community and environment, or public policy strategies.

The ECOP Task Force's blueprint offers 15 strategies to improve the health of young children ages 0-5 years across North Carolina.

The NCIOM Task Force on Early Childhood Obesity Prevention was co-chaired by Kathy Higgins, president, Blue Cross and Blue Shield of North Carolina Foundation; and Olson Huff, MD, former Chair, Board of Directors, North Carolina Partnership for Children, Inc., and Chair, Board of Directors, North Carolina Early Childhood Foundation. They were joined by more than 70 other ECOP Task Force members including core group members, and clinical, community/environment, and policy workgroup members. The ECOP Task Force met 14 times between September 2011 and May 2013.

The ECOP Task Force's blueprint offers 15 strategies to improve the health of young children ages 0-5 years across North Carolina that can occur through a concerted effort of state and community partners at multiple levels of the socioecological model. This blueprint is intended to serve as a guide for foundations, state and local government, health professional associations, and other community groups interested in improving the health of young children ages 0-5 years. The blueprint can be used to both foster new interventions, and align existing interventions around evidence-based or evidence-informed strategies that have the greatest likelihood of promoting healthy weight among young children. Over time, the blueprint may need to be modified as we gain a better understanding of what works to promote healthy weight for young children. Further, outside events may influence implementation—such as changes in the funding or structure of our current health care or child care delivery systems. Thus, the blueprint should be viewed as a "living document" which can be modified, as needed, to achieve the goals of preventing early childhood overweight and obesity.

The blueprint contains five chapters, with this chapter serving as an introduction to the work of the ECOP Task Force and the problem and consequences of early childhood obesity. Chapter 2 reviews previous recommendations by other expert groups to address and prevent early childhood obesity. Chapter 3 focuses on the ECOP Task Force's clinical strategies to enhance and expand continuing

education opportunities for health professionals, among other goals. Chapter 4 presents the ECOP Task Force's community and environment strategies aimed at improving child care programs and other health-promoting initiatives. Finally, chapter 5 discusses the ECOP Task Force's policy strategies to promote healthy behaviors, expand the state's focus on early childhood health, and improve data collection. The report also contains five appendices: Appendix A shows a Centers for Disease Control and Prevention Growth Chart recommended for use with children ages 2-20 years; Appendix B provides the World Health Organization Child Growth Standards recommended for use with children 0-23 months; Appendix C presents the full list of strategies developed by the ECOP Task Force; Appendix D reports the full list of related recommendations from the six expert state and national groups reviewed by the ECOP Task Force; and Appendix E presents additional community and environment strategies developed by the ECOP Task Force, but not included in this report as priority strategies.

The blueprint should be viewed as a "living document" which can be modified, as needed, to achieve the goals of preventing early childhood overweight and obesity.

References

1. Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion. Overweight and Obesity: Basics About Childhood Obesity. Centers for Disease Control and Prevention website. http://www.cdc.gov/obesity/childhood/basics.html. Published April 27, 2012. Accessed April 5, 2013.

2. Ogden CL, Carroll MD, Kit BK, Flegal KM. National Center for Health Statistics, Centers for Disease Control and Prevention. Prevalence of Obesity in the United States, 2009–2010. http://www.cdc.gov/nchs/data/databriefs/db82.pdf. Published January 2012. Accessed April 5, 2013.

3. Centers for Disease Control and Prevention. Adult Obesity Facts. http://www.cdc.gov/obesity/data/adult.html. Published August 13, 2012. Accessed May 23, 2013.

4. Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion. Overweight and Obesity. http://www.cdc.gov/obesity/index.html. Published December 21, 2012. Accessed April 5, 2013.

5. Centers for Disease Control and Prevention. Nutrition Services Branch, Women's and Children's Health, NC Division of Public Health, NC Department of Health and Human Services. 2011 Pediatric Nutrition Surveillance: North Carolina Summary of Demographic Indicators Children Aged < 5 Years. http://www.nutritionnc.com/pdfPregPed/PNSS/PedNSS2011StateTables.pdf. Published March 13, 2012. Accessed April 5, 2013.

6. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA.* 2012;307(5):483.

7. Singh AS, Mulder C, Twisk JW, Mechelen W, Chinapaw, M. Tracking of childhood overweight into adulthood: A systematic review of the literature. *Obesity Reviews.* 2008;9(5):474-88.

8. Flegal KM, Shepherd JA, Looker AC, et al. Comparisons of percentage body fat, body mass index, waist circumference, and waist-stature ratio in adults. *Am. J. Clin. Nutr.* 2009;89(2):500-508.

9. Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention. About BMI for Adults. http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html. Published September 13, 2011. Accessed April 5, 2013.

10. Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention. Advantages of Using the WHO Growth Charts to Assess the Growth of Children from Birth to Aged 2 Years. http://www.cdc.gov/nccdphp/dnpao/growthcharts/who/recommendations/advantage.htm. Published December 19, 2012. Accessed April 5, 2013.

11. Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention. WHO Growth Standards Are Recommended for Use with Children Younger Than Aged 2 Years in the United States. http://www.cdc.gov/nccdphp/dnpao/growthcharts/who/recommendations/index.htm. Published December 19, 2012. Accessed April 5, 2013.

12. Taveras EM, Gortmaker SL, Hohman KH, et al. Randomized controlled trial to improve primary care to prevent and manage childhood obesity: The high five for kids study. *Arch. Pediatr. Adolesc. Med.* 2011;165(8):714-722.

13. Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention. Overweight and Obesity: Causes and Consequences. http://www.cdc.gov/obesity/adult/causes/index.html. Published April 27, 2012. Accessed April 5, 2013.

14. Nader PR, O'Brien M, Houts R, et al. Identifying risk for obesity in early childhood. *Pediatrics.* 2006;118(3):e594-601.

15. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N. Engl. J. Med.* 1997;337(13):869-873.

16. Skinner AC, Steiner MJ, Henderson FW, Perrin EM. Multiple markers of inflammation and weight status: Cross-sectional analyses throughout childhood. *Pediatrics.* 2010;125(4):1.

17. Skinner AC, Steiner MJ, Perrin EM. Healthy for now? A cross-sectional study of the co-morbidities in obese preschool children in the united states. *Clin Pediatr.* 2010;49(7):648.

18. Skinner AC, Mayer ML, Flower K, Perrin EM, Weinberger M. Using BMI to determine cardiovascular risk in childhood: How do the BMI cutoffs fare? *Pediatrics.* 2009;124(5):905.

19. Dietz WH. Health consequences of obesity in youth: Childhood predictors of adult disease. *Pediatrics.* 1998;101(3):518.

20. Juonala M, Magnussen CG, Berenson GS, et al. Childhood adiposity, adult adiposity, and cardiovascular risk factors. *N Engl J Med.* 2011;365(20):1876.

21. Lee JM, Gebremariam A, Vijan S, Gurney JG. Excess body mass index-years, a measure of degree and duration of excess weight, and risk for incident diabetes. *Arch Pediatr Adolesc Med.* 2012;166(1):42.

22. Dietz WH, Nelson A. Barriers to the treatment of childhood obesity: A call to action. *J. Pediatr.* 1999;134(5):535-536.

23. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The bogalusa heart study. *J. Pediatr.* 2007;150(1):12-17.e2.

24. Centers for Disease Control and Prevention. Childhood Obesity Facts. http://www.cdc.gov/healthyyouth/obesity/facts.htm. Published February 19, 2013. Accessed April 5, 2013.

25. Centers for Disease Control and Prevention. Children and Diabetes — More Information. http://www.cdc.gov/diabetes/projects/cda2.htm. Published April 3, 2012. Accessed April 5, 2013.

26. National Institutes of Health. What Causes Overweight and Obesity? http://www.nhlbi.nih.gov/health/health-topics/topics/obe/causes.html. Published July 13, 2012. Accessed April 5, 2013.

27. Bernstein R. *Praxis and Action.* Ed. Anonymous Philadelphia: University of Pennsylvania Press; 1971.

28. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N. Engl. J. Med.* 1997;337(13):869-873.

29. Academy of Nutrition and Dietetics. Healthy Weight during Pregnancy. http://www.eatright.org/Public/content.aspx?id=10933. Published January 2013. Accessed April 5, 2013.

30. Rich SS, DiMarco NM, Huettig C, Essery EV, Anderson E, Sanborn CF. Perceptions of health status and play activities in parents of overweight hispanic toddlers and preschoolers. *Family & Community Health.* 2005;28(2):130.

31. Kumanyika S. Environmental influences on childhood obesity: Ethnic and cultural influences in context. *Physiol Behav.* 2008;94(1):61.

32. Sallis JF, Glanz K. The role of built environments in physical activity, eating, and obesity in childhood. *Future Child.* 2006;16(1):89-108.

33. Pate RR, O'Neill JR. Physical activity guidelines for young children: An emerging consensus. *Arch. Pediatr. Adolesc. Med.* 2012;166(12):1095-1096.

34. Todd J, Mancino L, Lin BH. Economic Research Report No. (ERR-90) 24. The Impact of Food Away From Home on Adult Diet Quality. http://ers.usda.gov/publications/err-economic-research-report/err90.aspx#.UVXp7qs4U1w. Published February 2010. Accessed April 5, 2013.

35. Mancino L,Todd JE, Guthrie J, Lin BH. Economic Research Service, United StatesDepartment of Agriculture. How Food Away From Home Affects Children's Diet Quality. http://www.ers.usda.gov/media/136261/err104_3_.pdf. Published October 2010. Accessed April 5, 2013.

36. Centers for Disease Control and Prevention. Research to Practice Series, No. 6. Incorporating Away-From-Home Food into a Healthy Eating Plan. http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/r2p_away_from_home_food.pdf. Accessed April 5, 2013.

37. Rey-Lopez JP, Vicente-Rodriguez G, Biosca M, Moreno LA. Sedentary behaviour and obesity development in children and adolescents. *Nutr Metab Cardiovasc Dis.* 2008;18:242.

38. Boone JE, Gordon-Larseon P, Adair LS, Popkin BM. Screen time and physical activity during adolescence: Longitudinal effects on obesity in young adulthood. *Int J Behav Nutr Phys Act.* 2007;4:26.

39. Henderson VR. Longitudinal associations between television viewing and body mass index among white and black girls. *J Adolesc Health.* 2007;41:544.

40. O'Brien M, Nader PR, Houts RM, et al. The ecology of childhood overweight: A 12-year longitudinal analysis. *Int J Obes.* 2007;31:1469.

41. Danner FW. A national longitudinal study of the association between hours of TV viewing and the trajectory of BMI growth among US children. *J Pediatr Psychol.* 2008;33:1100.

42. Obesity Prevention Source Web site. Television Watching and "Sit Time". Harvard School of Public Health website. http://www.hsph.harvard.edu/obesity-prevention-source/obesity-causes/television-and-sedentary-behavior-and-obesity/. Accessed April 5, 2013.

43. Taveras EM, Rifas-Shiman SL, Oken E, Gunderson EP, Gillman MW. Short sleep duration in infancy and risk of childhood overweight. *Arch. Pediatr. Adolesc. Med.* 2008;162(4):305-311.

44. North Carolina Department of Child Development and Early Education. North Carolina Population by Age, 2010-2019. http://www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/demog/statesingleage_2010_2019.html. Published 28 Jan 2013. Accessed April 5, 2013.

45. North Carolina Institute of Medicine. Chapter 2: The role of evidence-based strategies in public health. In: *Improving North Carolina's Health: Applying Evidence for Success.* 2012.

46. Institute of Medicine (IOM). The National Academies Press. Early Childhood Obesity Prevention Policies. Washington, DC. http://www.iom.edu/Activities/Nutrition/YoungChildObesity/2011-JUN-23.aspx. Published 2011. Accessed April 5, 2013.

47. White House Task Force on Childhood Obesity. Executive Office of the President of the United States. Solving the Problem of Childhood Obesity Within a Generation. http://www.letsmove.gov/white-house-task-force-childhood-obesity-report-president. Published May 2010. Accessed April 5, 2013.

48. North Carolina General Assembly. Task Force on Childhood Obesity. Raleigh, NC. http://www.ncleg.net/documentsites/committees/LTFCO/2010%20Task%20Force%20on%20Childhood%20Obesity%20Final%20Report%20.pdf. Published 2010. Accessed April 5, 2013.

49. North Carolina Enhanced Nutrition Standards for Child Care Final Report to the General Assembly. North Carolina Division of Public Health. http://ncchildcare.dhhs.state.nc.us/pdf_forms/child_nutrition_study.pdf. Published 2010. Accessed April 5, 2013.

50. North Carolina Institute of Medicine. Prevention for the Health of North Carolina: Prevention Action Plan. http://www.nciom.org/wp-content/uploads/NCIOM/projects/prevention/finalreport/PreventionReport-July2010.pdf. Published October 2009. Accessed April 5, 2013.

51. NC Health and Wellness Trust Fund (HWTF). Childhood Obesity in North Carolina. http://www.healthwellnc.com/hwtfc/pdffiles/FitFamilies-StudyCommitteeReport05.pdf. Published 2005. Accessed April 5, 2013.

52. Martin RM, Patel R, Kramer MS, et al. Effects of promoting longer-term and exclusive breastfeeding on adiposity and insulin-like growth factor-I at age 11.5 years: A randomized trial. *JAMA.* 2013;309(10):1005-1013.

53. Casazza K, Fontaine KR, Astrup A, et al. Myths, presumptions, and facts about obesity. *N. Engl. J. Med.* 2013;368(5):446-454.

54. Casazza K, Fernandez JR, Allison DB. Modest protective effects of breast-feeding on obesity: Is the evidence truly supportive? *Nutrition Today.* 2012;47(1):33-38.

55. Office on Women's Health, Office of the Assistant Secretary for Health, US Department of Health and Human Services. Why breastfeeding is important. http://www.womenshealth.gov/breastfeeding/why-breastfeeding-is-important/index.html. Published August 04, 2010. Accessed May 1, 2013.

56. Groer MW, Jevitt CM, Sahebzamani F, Beckstead JW, Keefe DL. Breastfeeding status and maternal cardiovascular variables across the postpartum. *J Womens Health.* 2013;22(5):453.

57. Stuebe AM, Mantzoros C, Kleinman K, Gillman MW, Rifas-Shiman S, Gunderson EP, Rich-Edwards J. Duration of lactations and materinal adipokines at 3 years postpartum. *Diabetes.* 2011;60(4):1277.

58. Schwarz EB, Brown JS, Creasman JM, Steube A, McClure CK, Van Den Eeden SK, Thom D. Lactation and maternal risk of type 2 diabetes: A population-based study. *Am J Med.* 2010;123(9):863.