The Impact of the First 1,000 Days on Childhood Obesity

Healthy Eating Research
Building evidence to prevent childhood obesity

Issue Brief, March 2016

Introduction

Obesity is seen in all age groups in the United States, with one-third of U.S. children and adolescents ages 2 to 19 estimated to be overweight or obese.[1] Approximately 8.1 percent of U.S. children under the age of 2 are predisposed to obesity. The first 1,000 days, or the period from conception until a child turns 2, is increasingly recognized as a critical period for the development of childhood obesity and its adverse consequences.[2]

Childhood obesity originates in early life and is seen disproportionately in racial and ethnic minority children.[3,4] Among 2 to 5 year olds, Hispanic children have rates of obesity almost five times higher than their non-Hispanic white counterparts, and non-Hispanic black children have rates three times higher than white children.[1,5-7] The first years of life appear to have a substantial impact on the disproportionate rates of obesity seen later in childhood, especially among racial and ethnic minority children.[8-13]

Despite mounting evidence that the first 1,000 days is an important period in the development and prevention of childhood obesity, especially among racial and ethnic minorities, no systematic review has focused on the factors that contribute to childhood obesity from conception through 2 years of age.

This issue brief is based on two review papers that examined evidence from selected studies published between January 1, 1980 and December 12, 2014. One paper reviewed the evidence on risk factors in the first 1,000 days for developing childhood obesity later in life. The second paper reviewed evidence on interventions in the first 1,000 days that could prevent childhood obesity later in life. Systematic reviews published from 2012-2015 were also included. Both papers are cited at the end of this issue brief. The findings summarized in this issue brief do not include all risk factors and interventions identified in the two papers, only those that were associated with childhood obesity across many or most studies, or had otherwise drawn recent interest from others in the field.

The evidence examined in the two review papers did not include cross-sectional studies that used data collected at only one point in time, nor did they include studies that relied on parents' memory after their child had turned 2 years of age. The studies on interventions included only those that had a control group and an intervention group, and were implemented between conception and 24 months, with weight and obesity data from 6 months to18 years of age. After screening and full-text review, a total of 282 articles met criteria for being included as the evidence base on risk factors and 34 articles met the criteria for interventions.

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Evidence

This issue brief presents evidence on risk factors in two main timeframes: from conception to birth and from birth through 2 years of age. It includes biological factors, parent and community factors, environmental concerns, health care delivery, infant behavior, and feeding practices. The evidence on interventions includes those conducted during pregnancy, those starting at pregnancy and continuing after birth, and those starting after birth but taking place before the child reached 2 years of age. Evidence on risk factors that are of topical interest to a variety of stakeholders is also summarized here.

Risk factors from conception through birth

- Thirty-three studies examined the relationship between maternal diabetes during pregnancy and childhood overweight. Of those 33 studies, 22 noted significant associations between maternal diabetes and childhood overweight,[14-35] and 11 found no association.[36-46]
- Three studies used ultrasound measures and all three found a positive correlation between higher rates of fetal growth and later childhood obesity.[47-49]
- Higher maternal pre-pregnancy body mass index (BMI) consistently suggested the baby would be overweight later in childhood, according to 34 of 38 articles.[24,34,36,39,41,43,48,50-76]
- Nineteen studies reported that excess maternal weight gain during pregnancy consistently and significantly increased the risk for childhood overweight,[43,50,52,54,76-90] while only two studies reported no association with child overweight.[48,91]
- Three studies of self-reported stress by mothers during pregnancy found higher stress levels were associated with higher odds of later childhood overweight,[92-94] but one study found no association between stress measured by salivary cortisol levels and childhood overweight.[95]
- In 23 studies, smoking during pregnancy was associated with increased odds of the baby being overweight.[34,56,62,85,96-114] Eight additional studies did not find statistically significant associations between maternal tobacco smoking during pregnancy and offspring overweight.[43,48,76,91,115-118]

Risk factors from birth through age 2

- Higher birth weight was consistently associated with later childhood overweight, in 24 of 28 studies.[34,36,48,56,57,68,76,118-134]
- Of the 46 studies examining rapid weight gain and higher absolute weight-for-length during the first 2 years of life, 45 found an association between higher infancy weight or higher weight gain and later childhood overweight.[19,48,51,57,68,74,100,121,135-171]
- In one study, children who got fewer than 12 hours of daily sleep between ages 6 months to 24 months had almost twice the odds of obesity at age 3 than did those with 12 or more hours of daily sleep.[172] In a follow-up study, children who had insufficient sleep between ages 6 months to 7 years had higher odds of obesity than those with more optimal sleep in the same age bracket.[173] Two studies on infants with sleep difficulties found no association between infancy sleep duration and later childhood obesity.[48,174]
- Three large U.S. studies found an association between socioeconomic status (SES) during the first 1,000 days and later childhood overweight.[57,175,176] One study using the National Longitudinal Study of Youth (NLSY) found higher odds of overweight among children in middle-income households compared to high-income families.[175] Data from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), a sample of children followed from birth through kindergarten entry, found that lower SES based on parent education and household income was a risk factor for child overweight.[57]
- Of the five published papers that examined the role of mother-child relationship, four found that a low-quality relationship or lower maternal sensitivity were associated with child overweight.[177-181]
- Two large prospective U.S. birth cohorts of primarily non-Hispanic white children examined child-care attendance during the first 1,000 days.[182,183] Both found a small but significant association of any child-care attendance with increased risk of child obesity.

Interventions during pregnancy

- There were only two interventions during pregnancy that met criteria for this review, and neither was effective in mitigating childhood obesity. One of the interventions provided dietary advice, prenatal coaching, and exercise, and the other provided treatment of mild gestational diabetes during pregnancy.[184,185]

Interventions during pregnancy and continuing after birth

- Two interventions that utilized home visiting were found to be effective in improving child BMI measures.[186,187]
- In one of those two interventions, community nurses made eight educational home visits focused on infant diet and feeding and maternal physical activity during pregnancy and through 24 months of age.[187] At 24 months, children in the intervention had a BMI that was 0.29 kg/m^2 lower than those in the control group.

- Another intervention in which community health workers provided education on maternal diet and infant feeding practices at a combination of home and group visits successfully reduced the child age-specific BMI score by 0.31 and reduced risk of overweight by 57 percent at 13 to 24 months.[186]
- One intervention that promoted breastfeeding education in hospitals substantially improved breastfeeding initiation rates, but did not show BMI improvements among children at age 6.5 and 11.5 years.[188,189]

Interventions starting after birth

- In a multi-center trial in five European countries, a low-protein formula administered during the first year of life was associated with 0.23 lower BMI score and 0.20 lower mean weight-for-length score at 24 months compared to a high-protein formula.[190] With further follow-up, infants in the high-protein formula group had a higher risk of being obese at age 6 than infants in the breastfed control group.[191]
- One intervention targeting mothers' physical activity and diet during the first year of the infant's life resulted in a slightly slower rise in child BMI scores between ages 2 and 4 compared to a control group.[192]
- Another intervention provided more frequent behavioral counseling on diet and physical activity for the entire family from when the infant was 7 months to 10 years old. It found a lower prevalence of overweight among daughters at age 10, but not among sons, when compared to the control group that got routine counseling.[193]

Evidence on Other Topics of Interest

The paper on risk factors concluded that there were inconsistent results related to the impact of breastfeeding, food insecurity, and maternal depression on childhood obesity.

Conclusions

The first 1,000 days are a critical period for childhood obesity development, and thus prevention. This systematic review of nearly 300 studies finds several risk factors during the first 1,000 days that were consistently associated with later childhood overweight:

- higher maternal pre-pregnancy BMI;
- maternal excess weight gain during pregnancy;
- prenatal tobacco exposure;
- high infant birth weight; and
- high infant weight gain.

Targeting these factors holds promise for childhood obesity prevention efforts.

A smaller number of studies also found several other factors that were associated with an increased risk of childhood obesity:

- gestational diabetes;
- child-care attendance;
- low strength of maternal-infant relationship;
- low SES; and
- insufficient infant sleep.

The systematic review of interventions occurring in the first 1,000 days showed that most interventions demonstrated an effect by focusing on individual- or family-level behavior changes through home visits; individual counseling or group sessions in clinical settings; or using a combination of home and group visits. The finding of only a small number of effective early life interventions for childhood obesity prevention is not uncommon. Prior reviews of interventions in the first years of life have also revealed small numbers of published studies, most of which employ suboptimal study designs and demonstrate minimal or no impact on child growth measures.[194-197]

Taken together, the two papers suggest that programs and efforts focusing on multiple risk factors and delivered at multiple levels (individual, family, and community) through various sectors (health care, industry, and policy) may help reduce childhood obesity risk. The challenge now is to be innovative in the creation of population-level obesity prevention interventions that are cost-effective and sustainable.[198,199]

This issue brief is based on the findings from two publications:

Woo Baidal JA[1,2], Locks LM[3], Cheng ER[1], Blake-Lamb T[4,5], Perkins M[1], Taveras EM[1,3]. Risk Factors for Childhood Obesity in the First 1,000 Days. A Systematic Review. In Press at *Am J Prev Med*.

Blake-Lamb T[4,5], Locks LM[3], Perkins M[1], Woo Baidal JA[1,2], Cheng ER[1], Taveras EM[1,3]. Interventions for Childhood Obesity in the First 1,000 Days. A Systematic Review. In press at *Am J Prev Med.*

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About Healthy Eating Research

Healthy Eating Research (HER) is a national program of the Robert Wood Johnson Foundation. Technical assistance and direction are provided by Duke University and the University of Minnesota School of Public Health under the direction of Mary Story, PhD, RD, program director, and Laura Klein, MPH, deputy director. HER supports research to identify, analyze, and evaluate environmental and policy strategies that can promote healthy eating among children and prevent childhood obesity. Special emphasis is given to research projects that benefit children and adolescents and their families, especially in lower-income and racial and ethnic populations at highest risk for obesity. For more information, visit ***www.healthyeatingresearch.org*** or follow HER on Twitter at ***@HEResearch***.

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