Childhood Obesity Risk and Prevention: Shining a Lens on the First 1000 Days

Elsie M. Taveras, MD, MPH^{1,2}

The first 1000 days—the period from conception to age 2 years—is increasingly recognized as an important period for the development, and thus prevention, of obesity and its adverse consequences. In recent years, the National Academies of Sciences, Engineering, and Medicine¹ and the NIH² have convened multidisciplinary workshops to examine the state of the science and promising solutions to reduce the risk of childhood obesity beginning in early life. Additionally, The World Health Organization's Report of the Commission on Ending Childhood Obesity³ emphasized the important role of the preconception, antenatal, and early childhood periods in prevention of childhood obesity, and the Robert Wood Johnson Foundation recently published an issue brief on the impact of the first 1000 days on childhood obesity.⁴ Yet, substantial knowledge gaps remain in the understanding of etiology and plausible behavioral and biological mechanisms of obesity development in early life, and few interventions have been conducted to demonstrate the extent to which prevention in early life has a beneficial effect on infant growth status and obesity-related behaviors.

For this theme issue of *Childhood Obesity*, we asked investigators from a range of disciplines to submit articles that advanced the science of early life obesity risk factors and prevention. Taken together, the articles in this issue begin to narrow the evidence gaps and present emerging and promising methods and approaches to further inform obesity prevention beginning in early life.

Claesson and colleagues,⁵ Fuemmeler and colleagues,⁶ and Gregory and colleagues⁷ examined risk factors and interventions in pregnancy. Fuemmeler and colleagues examined associations of maternal prepregnancy obesity and gestational weight gain with infant weight trajectories in the first 24 months of life using the SuperImposition by Translation and Rotation (SITAR) method, which provides estimates of infant size, timing to peak velocity, and growth velocity. Both prepregnancy obesity and greater-than-adequate gestational weight gain were indepen-

dently associated with risk for greater early postnatal weight growth. These findings suggest that maternal obesity and excessive gestational weight gain may be targets for interventions to prevent child obesity risk. Yet, in two follow-up studies of infants whose mothers participated in interventions to prevent excessive weight gain during pregnancy, Claesson and colleagues and Gregory and colleagues did not find a protective effect of reduced gestational weight gain on offspring BMI. Neither intervention continued to work with the parent-infant dyad in infancy. Previous observational studies that followed offspring of mothers who were participants in interventions targeting gestational weight gain or gestational diabetes, and in which the interventions ceased after birth, have similarly found no “spillover” effect on childhood obesity.^{8,9} The studies by Claesson and Gregory suggest the need for risk-reducing interventions to be continued or maintained in infancy once they have begun in the prenatal period in order to influence child obesity risk.

Several of the studies in this issue examine risk factors for greater weight-for-length increases in the first year of life¹⁰ and at age 6 years¹¹ and with increasing leptin levels from 6 months to 8 years of age.¹² All of these studies examined infant feeding as a potential risk factor. However, studies of infant feeding practices and mode and how they shape growth trajectories have shown inconsistent results.^{13–16} For example, whereas some previous studies have shown that early introduction of solid foods is associated with childhood obesity,¹⁶ others,¹⁵ including that of Barerra and colleagues¹¹ in this issue, have not found a robust association of introduction of solid foods before 4 months of age with obesity risk. These inconsistencies make it imperative for future research to examine novel, protective nutritional strategies for improving diet quality and preventing childhood obesity. Promising studies suggest that one approach to improving infant diet quality—and perhaps reduce child obesity risk—may be through influencing the dietary behaviors of their *parents*.¹⁷ As summarized by Mennella and

¹Division of General Academic Pediatrics, Department of Pediatrics, Massachusetts General Hospital for Children and Harvard Medical School, Boston, MA.

²Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA.

colleagues,¹⁷ if mothers feed their infants broccoli but never eat broccoli themselves, the likelihood that their infants will express and solidify their preferences for this vegetable is markedly diminished. Likewise, parents who themselves drink sugar-sweetened beverages may be more likely to offer these beverages to their infants. Thus, one way to raise a “broccoli eater” and one who prefers water may be to influence parental dietary and beverage quality.

Redsell and colleagues¹⁸ present validation results for the Infant Risk of Overweight Checklist (IROC)—a tool that assess an infants’ risk of overweight in childhood up to 5 years of age based on seven predictors: sex; birth weight; age-adjusted weight gain; maternal prepregnancy BMI; paternal BMI; maternal smoking in pregnancy; and breastfeeding status during the first year. The researchers suggest a way to potentially implement the checklist in a clinical setting by computer software on a hand-held tablet device designed for clinical use with parents. Electronic health records and the increasing collection of patient-reported outcomes in primary care may also facilitate screening of children at risk and provision of resources for prevention.

Finally, Machuca and colleagues¹⁹ report the results of a quasi-experimental study of group well-child care visits beginning at age 2 months and continuing through 24 months of age, facilitated by a pediatrician and nutritionist and incorporating a nutrition curriculum delivered at each session, and effects on BMI compared to traditional well-child care. Children who were in the well-child group sessions had lower rates of overweight or obesity at age 2 years compared with children receiving traditional care. The study by Machuca and colleagues is also notable for developing an approach that was feasible and well accepted by low-income families. Given the high prevalence of obesity among low-income and racial/ethnic minority communities, studies such as those by Machuca and colleagues are particularly important for informing interventions in the populations that need them most.

Several methodological research gaps remain in our knowledge of obesity etiology in early life, but major national initiatives including the NIH Environmental Influences on Child Health Outcomes Program hold promise in accelerating knowledge and evidence of physical, chemical, biological, social, behavioral, natural, and built environments and how they influence child health and development.²⁰ Much work remains to be done investigating emerging risk factors, such as toxins and disruptors of the gut microbiota, and the genetic and epigenetic susceptibilities that may mediate relationships between such exposures and risk factors for obesity. We hope that the articles published in this theme issue, along with the recent attention to the first 1000 days of life and several upcoming initiatives to examine early life exposures and child health outcomes, will serve to highlight this important period for prevention of obesity and its related chronic diseases.

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Address correspondence to:
Elsie M. Taveras, MD, MPH
Chief, Division of General Academic Pediatrics
Department of Pediatrics
Massachusetts General Hospital for Children
125 Nashua Street
Suite 860
Boston, MA, 02114

E-mail: elsie.taveras@mgh.harvard.edu