



Published in final edited form as:

*Arch Pediatr Adolesc Med.* 2010 December ; 164(12): 1167–1169. doi:10.1001/archpediatrics.2010.218.

## The Infancy of Obesity Prevention

**Robert C. Whitaker, MD, MPH**

Department of Public Health, Department of Pediatrics, and the Center for Obesity Research and Education, Temple University

### Keywords

obesity; child; prevention; sleep; diet; physical activity; self-regulation

Pediatricians are being encouraged to begin obesity prevention during infancy,<sup>1</sup> yet they must still rely more on common sense than scientific evidence to guide their actions. Although the childhood obesity epidemic has been recognized for a decade, the field of obesity prevention has only now reached infancy. A pediatrician wishing to begin obesity prevention efforts during infancy faces two general questions. On what infants should I intervene? How, if at all, should I intervene? A paper by Gungor et al. in this issue of *Archives* addresses the first question,<sup>2</sup> and one by Ciampa et al addresses the second.<sup>3</sup> The answers provided by these papers are succinct. We cannot accurately predict which infants will become obese. Nearly 70% of “at risk” infants were not overweight or obese at 6 to 8 years of age, so it is hard to target specific infants for prevention efforts. Whether some or all infants are targeted for intervention, we have no strong evidence about which interventions prevent or reduce obesity.

While awaiting further research, pediatricians can work with parents to modify behaviors that meet the following three criteria: the behavior, if adopted, (1) may prevent obesity, (2) may benefit some aspect of health or well-being other than preventing obesity, and (3) is unlikely to cause harm.<sup>4</sup> For infants, behaviors which meet these criteria can be organized under the central activities of infancy: eating, playing, and sleeping. Pediatricians may find it easier to address obesity prevention in infancy in the context of these activities that already consume most of parents’ time and effort.

### Eating

For eating, three behaviors to target are breastfeeding, feeding appropriate portion sizes, and limiting the consumption of sugar-sweetened beverages. In addition to its other health benefits, breastfeeding may prevent obesity.<sup>5</sup> Compared to bottle feeding, breastfeeding may allow infants to have more control over the initiation and termination of feedings and, thereby, enhance the development of their ability to regulate food intake in response to physiologic signals of hunger and satiety.<sup>6</sup> Other areas of self-regulation, such as those involving attention, emotion, and movement, could be entrained by early feeding interaction, making breastfeeding a more favorable method than bottle feeding for the early development of self-regulation.

---

Address correspondence to: Robert C. Whitaker, MD, MPH, Professor of Public Health and Pediatrics, Temple University, Center for Obesity Research and Education, 3223 North Broad Street, Suite 175, Philadelphia, PA 19140; Phone: 215-707-8676; Fax: 215-707-6462; rwhitaker@temple.edu.

The majority of mothers, however, do not exclusively breastfeed, and feeding appropriate portion sizes deserves attention for all infants receiving any formula. It can be hard for parents to know how much formula to feed their infants. This requires understanding the infant's hunger and satiety signals. How should parents address the daily challenge of identifying and meeting the needs of fussy infants who may or may not be hungry? A safe approach is to encourage parents to first hold the baby and "hold off" on the bottle, especially if the child was fed within the last 1 or 2 hours. Overfeeding might also be avoided by preparing 4 or 6 ounce bottles of formula rather than 8 ounce bottles, especially in the first 6 months of life. This smaller amount is more consistent with the intakes of milk at each breastfeeding. If the infant still seems hungry after consuming 6 ounces, more could then be given. This approach might enhance the self-regulation capacity of bottle-fed infants.

Overfeeding may be a particular risk for breastfed infants who also receive formula, especially if this feeding pattern is established because the parents (or grandparents) perceive that breast milk alone is not adequately nourishing the infant. Breast milk and formulas have similar caloric density; too many calories are too many calories, regardless of their source. Finally, parents can safely eliminate all sugar-sweetened beverages, including juice, from the diets of their infants. Doing so may help prevent obesity<sup>7</sup> and dental caries.<sup>8</sup>

## Playing

Rather than discussing physical activity or energy expenditure with the parents of infants, pediatricians should encourage parents to enhance their infant's development through interactive play. Optimal development requires infants to have the opportunity to move safely before they achieve the motor milestones of crawling or walking. All infants who are not yet rolling should be allowed to spend awake time each day in the prone position ("tummy time") to promote their development and to avoid positional skull deformity.<sup>9</sup> The cognitive and social development of infants is enhanced through sensory input and the amount and diversity of that sensory input is increased by movement.<sup>10</sup> Where and how infants are permitted to move and explore their environment affects what they touch, hear, smell, and know. It is also through body movement that infants communicate to others while verbal language is developing. The settings for infant movement should include the outdoors. Infants should be taken outdoors regularly if it is also safe for the parent to be outdoors. Sunlight is beneficial for bone health, and the sensory stimulation of outdoor environments is more varied than it is indoors.

Despite the requirement that infants move to optimize their motor and non-motor development, well-intentioned parents, for convenience or safety, may inadvertently restrict movement. Parents can avoid this by using devices such as car seats, strollers, and cribs only for their primary purpose. Car seats, for example, should not generally be used to hold infants who are not in cars, strollers to hold infants who are not being moved, or cribs to hold infants who are not sleeping. Overusing these confining devices may potentially inhibit movement, energy expenditure, and even cognitive and social development. Injury is the major risk of removing these constraints, and this is a particular concern as infants learn to crawl, cruise, and walk. However, this emerging mobility is a natural development of late infancy that meets the child's need to explore their environment and play in a way that stimulates their overall development. In late infancy, this movement naturally increases energy expenditure. Not surprisingly, body mass index (relative weight but not absolute weight) normally begins to decline at this age. From late infancy through the preschool age parents face a dilemma about when to restrict movement for safety and when to allow movement to enhance their child's development. This dilemma is best addressed by the parent joining the child in play.

It is never too early to discuss screen-time. Although there is no clear evidence that infant TV viewing is associated with the development of obesity, there are no identifiable benefits of TV viewing in infancy. Avoiding all screen time in infancy is the best approach if only to prevent the impact on cognitive and social development of substituting screens for face-to-face human interaction.

## Sleeping

Evidence is accumulating that short sleep duration may be a risk factor for childhood obesity.<sup>11</sup> Children's sleep problems have been a long-standing concern for parents. Most parents find that when their child sleeps poorly, the parents usually sleep poorly and that harmonious interactions of the family are harder to achieve. Short sleep duration has been associated with functional impairments in older children, including poor attention, aggression, and low mood,<sup>12</sup> but whether short sleep duration causes or reflects these problems remains unclear.

By age two the average child has spent over half of its life asleep. However, there has been little research on how best to develop healthy sleep patterns in children. The ability to initiate and sustain sleep is a self-regulatory capacity, which, like the development of healthy appetite regulation, requires parental support. Parents should consider such practices as establishing consistent sleep-wake schedules and routines (including at naptimes) and reducing sensory stimulation (food, light, noise, activity) in the bedroom and near bedtimes. Two specific practices can be avoided without any apparent harm—placing a television in the child's bedroom and putting the child to sleep with a bottle. Aside from the potential of these practices to interfere with sleep, they may, if sustained beyond infancy, promote the development of obesity.

## Reaching parents

Although we lack evidence about how to prevent obesity in infants, there are a number of behaviors related to eating, playing, and sleeping that may have both obesity and non-obesity benefits while avoiding harms. Most thoughtful pediatricians who can find the time are already discussing these behaviors—breastfeeding, limiting sugar-sweetened beverages, feeding appropriate portions, playing with their infants, taking them outdoors, not constraining their movement, allowing tummy time, limiting screen time, and establishing healthy sleep routines.

In discussing all these behaviors, it is best to have two overriding themes—moderation and empowerment. Lack of moderation in behaviors can cause obesity but can also cause under nutrition, especially during infancy. Moderation also makes the behaviors more acceptable and sustainable to families. Parents should be empowered to make household policies and practices about how their infants eat, play, and sleep. Doing so requires parents to make active decisions about the goals they have for their child's development. Pediatricians have the opportunity to engage in a dialogue with parents about those goals and how the actions parents take to achieve them might also help children maintain a healthy weight.

## Acknowledgments

I thank Jeffrey A. Wright, MD for his helpful suggestions about this article.

This work was supported by grant from the National Institutes of Health (R01 DK088913). The funder had no role in the design and conduct of the study, in the collection, analysis and interpretation of the data, or in the preparation, review, or approval of the manuscript.

I had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

## References

1. Barlow SE. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007; 120(Suppl 4):S164–92. [PubMed: 18055651]
2. Gungor DE, Paul IM, Birch LL, Bartok CJ. Infant growth need not be rapid to be risky: refining pediatric screening for childhood overweight. *Arch Pediatr Adolesc Med*. In Press.
3. Ciampa PJ, Kumar D, Barkin SL, Sanders LM, Yin HS, Perrin EM, et al. Interventions aimed at impacting obesity in children under the age of two: a systematic review. *Arch Pediatr Adolesc Med*. In Press.
4. Whitaker RC. Obesity prevention in pediatric primary care: four behaviors to target. *Arch Pediatr Adolesc Med*. 2003; 157:725–7. [PubMed: 12912775]
5. Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. *Pediatrics*. 2005; 115:1367–77. [PubMed: 15867049]
6. Li RW, Fein SB, Grummer-Strawn LM. Do Infants fed from bottles lack self-regulation of milk intake compared with directly breastfed infants? *Pediatrics*. 2010; 125:E1386–E1393. [PubMed: 20457676]
7. Gortmaker, S.; Long, M.; Wang, C. The negative impact of sugar-sweetened beverages on children's health. Robert Wood Johnson Foundation Healthy Eating Research Program. 2009. Available at: <http://www.rwjf.org/files/research/20091203herssb.pdf>
8. Tinanoff N, Palmer CA. Dietary determinants of dental caries and dietary recommendations for preschool children. *J Public Health Dent*. 2000; 60:197–206. discussion 207-9. [PubMed: 11109219]
9. Persing J, James H, Swanson J, Kattwinkel J. Prevention and management of positional skull deformities in infants. American Academy of Pediatrics Committee on Practice and Ambulatory Medicine, Section on Plastic Surgery and Section on Neurological Surgery. *Pediatrics*. 2003; 112:199–202. [PubMed: 12837890]
10. Bushnell EW, Boudreau JP. Motor development and the mind: the potential role of motor abilities as a determinant of aspects of perceptual development. *Child Dev*. 1993; 64:1005–21. [PubMed: 8404253]
11. Chen X, Beydoun MA, Wang Y. Is sleep duration associated with childhood obesity? A systematic review and meta-analysis. *Obesity (Silver Spring)*. 2008; 16:265–74. [PubMed: 18239632]
12. Gregory AM, Van der Ende J, Willis TA, Verhulst FC. Parent-reported sleep problems during development and self-reported anxiety/depression, attention problems, and aggressive behavior later in life. *Arch Pediatr Adolesc Med*. 2008; 162:330–5. [PubMed: 18391141]