



## Assessment of Growth in Babies—A Journey From Exception to Benchmark

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### Commentary From the AAP Section on Breastfeeding

The Section on Breastfeeding (SOBr) was the culmination of consistent AAP advocacy that dates back to the work of the 1981 Task Force on the Promotion of Breast Feeding, which issued the 1982 policy statement entitled, “The Promotion of Breast Feeding.” The AAP later formed a Work Group on Breastfeeding in 1996-1997 which published an updated “Breastfeeding and the Use of Human Milk” policy. In 2000, the creation of SOBr consolidated and perpetuated the efforts of the Work Group and an inaugural group of statewide Chapter Breastfeeding Coordinators. The mission of the SOBr is to equip pediatricians with education, policy, and advocacy resources to support optimal breastfeeding practices and environments. To celebrate the anniversary of *Pediatrics*, we chose to focus on a topic that is central to all pediatricians, that is the assessment of growth.

### Assessment of Growth in Babies—A Journey From Exception to Benchmark

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### Highlighted Articles From *Pediatrics*

- Paiva, S. [Pattern of growth of selected groups of breast-fed infants in Iowa City](#). *Pediatrics*. 1953;11(1):38–47
- Dewey KG, Heinig MJ, Nommsen LA, Peerson JM, Lönnerdal B. [Growth of breast-fed and formula-fed infants from 0 to 18 months: the DARLING Study](#). *Pediatrics*. 1992;89(6 Pt 1):1035-41

- Ogden CL, Kuczmarski RJ, Flegal KM, Mei Z, Guo S, Wei R, Grummer-Strawn LM, Curtin LR, Roche AF, Johnson CL. [Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version.](#) *Pediatrics*. 2002;109(1):45-60
- Nader PR, O'Brien M, Houts R, Bradley R, Belsky J, Crosnoe R, Friedman S, Mei Z, Susman EJ; National Institute of Child Health and Human Development Early Child Care Research Network. [Identifying risk for obesity in early childhood.](#) *Pediatrics*. 2006 Sep;118(3):e594-601. doi: 10.1542/peds.2005-2801. Erratum in: *Pediatrics*. 2006;118(5):2270
- Paul IM, Schaefer EW, Miller JR, Kuzniewicz MW, Li SX, Walsh EM, Flaherman VJ. [Weight change nomograms for the first month after birth.](#) *Pediatrics*. 2016;138(6):e20162625

Over the past 75 years, policy and public perceptions of breastfeeding have transformed slowly from regarding breastfeeding as a beneficial personal choice to recognition of breastfeeding as the normative standard for infant feeding and a public health imperative. Hand in hand with this change, pediatricians' understanding of the breastfed infant's growth has transformed dramatically with key shifts in the evidence base published in *Pediatrics*. For this 75<sup>th</sup> anniversary of *Pediatrics* article, why focus on physical growth when there are so many other tangible and wonderful benefits of breastfeeding? Growth evaluation is core to our shared practice of pediatrics, and assessment of growth patterns, along with the conversations that ensue, fill many hours of routine clinical care. Adequate growth is inextricably linked with good overall child health outcomes and with milestone attainment in key developmental domains<sup>1,2</sup> and, critically, the choice and use of appropriate growth charts is essential to the interpretation of infant and child growth.<sup>3</sup>

Four landmark articles representing the past 3 quarter centuries of *Pediatrics*, augmented by one from the Centers for Disease Control and Prevention (CDC), showcase how thinking about breastfed infants' growth has evolved.<sup>4-6,8,10</sup> In 1953, Dr. Sylvio Paiva published monthly weight and "height" measures (birth to 6-7 months) of 21 male and 24 female infants of "well-fed" mothers living in Iowa City, IA, who were mostly exclusively breastfed and supplemented with vitamin D.<sup>4</sup> He concluded that the growth pattern of the breastfed infants did not differ significantly from that of formula-fed infants of the same socioeconomic group, and hence the growth charts of the formula-fed infants could be applied to breastfed infants. In Dr. Silvio's study from *Pediatrics*' first quarter century, breastfed babies are an uncommon exception, and the study question was whether their growth can "measure up" to that of formula-fed infants.

In the next quarter century, nearly 40 years later, Dr. Katherine Dewey and colleagues prospectively collected monthly growth data from birth through age 18 months for 46 nearly exclusively breastfed and 41 formula-fed infants in the Davis Area Research on Lactation, Infant Nutrition and Growth (DARLING) study.<sup>5</sup> The authors compared breastfed infants' growth both to that of formula-fed babies and to the growth reference of the day, the CDC 1977 National Center for Health Statistics Growth Charts. These CDC infant charts were based on the Fels cohort study, a mainly longitudinal growth record of 867 predominantly formula-fed infants from Yellow Springs, Ohio (1929-1975). The authors concluded that breastfed babies were "leaner," with lower weight-for-length z scores ages from 4 to 18 months, that their growth "...differ[s] from current reference data..." and in a startling and foretelling conclusion, that "...new growth charts based on breastfed infants are needed..."

In the final quarter century of *Pediatrics*, and a decade later, this shift occurs. In describing the transition from the 1977 to the 2000 CDC growth charts, in which "...breastfed infants are included... proportional to their distribution in the US population during the past 30 years..."<sup>6</sup> Dr. Ogden and colleagues note that from 1972-1994 about half of US infants ever breastfed and approximately one-third were breastfed for 3 months. However, the authors acknowledge, "...Adequate national data do not exist for exclusively or predominantly

breastfed infants, so creation of growth charts for breastfed infants is not possible....”<sup>6</sup> Enter the World Health Organization’s Multisite Growth Reference Study (WHO MGRS), whose multi-year, multi-country longitudinal study included 8,500 infants, all of whom were breastfed for 12 months and most of whom were exclusively breastfed at least through 4 months. This study generated the data needed for a growth standard for all breastfed infants.<sup>7</sup>

In 2006, the CDC, the National Institutes of Health, and the American Academy of Pediatrics convened an expert panel and agreed to adopt the 2006 WHO international growth charts, rather than the then current CDC growth charts, for children aged <24 months.<sup>8</sup> The 2010 CDC Morbidity and Mortality Weekly Report stated, “Deviation from the WHO growth standard should prompt clinicians to determine whether suboptimal environmental conditions exist and, if so, whether they can be corrected.”<sup>8</sup> Thus, understanding of the breastfed infant’s growth progressed over these three-quarter centuries from initial concerns about potential deficiency to recognition that the growth of breastfed babies should set the standard for growth of all infants.

Over time it has become clear that exclusively breastfed babies have different growth patterns than formula-fed infants, and not only does this emphatically *not* equate with poor growth, but in fact the fully breastfed infant is the normative standard against which all other growth should be compared. Over these past three-quarter centuries, research on infant and toddler growth has advanced from reliance on cross-sectional data based on relatively small numbers of infants to prospective, longitudinal, population-based studies. Growth charts changed in response to the evolution in quality of such studies as well as the framework for identifying how breastfed babies grow rather than using formula-fed babies as the reference. Growth “references,” like the Fels study, described the growth of certain children with uniform race/ethnicity from a small region that were predominantly formula fed. Now the medical community has a growth “standard” derived from the WHO MGRS, which describes how healthy children should grow given an optimal environment—one that includes full breastfeeding as recommended.<sup>9</sup> This shift in thinking began in the early 2000s and was in alignment with the recognition that the US was facing an alarming rise in childhood obesity, and that the patterns of overweight and obesity are established early in childhood.<sup>10</sup>

Research on growth can generate hypotheses, as well as critically inform the work clinicians do, as exemplified by each of the landmark studies described. Yet we need more data. The WHO MGRS was remarkable, but included infants who were not all optimally breastfed—will future studies be able to fine-tune our current growth standards? More detailed data are needed to guide clinician thinking, and the final article pick does just this: in a population-based study including 143,889 healthy infants, of whom 63% were exclusively breastfed, 14% of those delivered vaginally and 24% of those delivered by cesarean section had not regained birthweight at 14 days.<sup>11</sup> The authors suggest that this information, “...may even reduce the risk of breastfeeding cessation by reassuring mothers...” (and clinicians) about normal weight gain.<sup>11</sup> Nevertheless, future studies should also consider potential issues of concern, such as maternal obesity, low milk production with suboptimal intake, and the vulnerable newborn, such as those born prematurely. We have “...promises to keep, and miles to go before [we] sleep...”<sup>12</sup> but clinicians can confidently use published normative data to benefit the care of all mothers and infants, while recognizing that needed data updates will guide us on the journey forward into the next quarter century and beyond.

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