

Editor-in-Chief's Note

Baby Fat or a Fat Baby?



For a period of time in my childhood, our family lived on a stereotypical American neighborhood block. There was little traffic and shade trees lined the street. Given the hot sun, the lack of air conditioning, and the safety of the area, kids played a lot outside and were almost constantly active. Most preschoolers and elementary schoolers were on the thin side, but every once in a while a few children would be overweight. My mom used to say they had not yet lost their baby fat. Was my mom correct? By the fifth or sixth grade, most of the overweight kids had slimmed down. What we can never know is whether they dieted or their baby fat really was just slow to disappear.

Most adequately nourished newborns have fat rolls on their legs and arms and noticeably short to absent necks. Around 2 to 6 months, neck muscles develop and babies can hold head positions and voluntarily turn their heads. Now that parents are told to have babies sleep on their backs, periods of tummy time during the day may facilitate neck muscle strengthening. Sometime around 12 months, baby fat begins to disappear and neck elongation begins. This usually corresponds with when babies are able to stand and walk (ie, 10 to 18 months). Growth rate usually starts to be less rapid between years 2 and 3. Typically, by around years 3 or 4, most baby fat is gone, and the neck is now lengthened. My guestimates come

from what I learned on my pediatric rotations and from being a father, grandfather, and great grandfather. More authoritative information about these early developmental milestones is available from the American Academy of Pediatrics.¹ For example, the percentage of body weight that is fat should be maximal sometime around 12 months and decrease by about a half by 5 years of age.

Almost all babies are born relatively fat. Exceptions include babies born prematurely and those without adequate intrauterine nutrition. Babies born to mothers with type 2 diabetes tend to be overweight compared with those born to mothers without diabetes. Among offspring with diabetes, larger than average birthweights (fetal macrosomia) occur more often in female and premature progeny.² High maternal weight during pregnancy is also a contributing factor.³ Although almost all babies lose their baby fat when they begin to walk and become more active, not all cultures want their infants to lose their plumpness. For example, some Latino mothers believe that being overweight promotes health. Dr Yanira Cruz, executive director of Hispanic-Serving Health Professional Schools, suggests that this is “. . . a cultural idea that seems to start from previous generations. . . [and that some Latino mothers]. . . seem to be unaware that obesity could cause serious diseases such as diabetes, heart disease and some type of cancers.”⁴ The question of awareness was explored in a report by Bresnahan and colleagues.⁵ These authors studied responses to two messages about overweight babies and subsequent health problems and a “no-message” control. One message stated that baby fat would be lost as soon as walking started, and the second noted concern from pediatricians about subsequent health problems linked to early obesity. The answers from an American adult cohort (n = 233) were compared with those from three aggregated Asian groups (n = 195); the latter included relatively equal numbers of responders from China, Japan, and Korea. Compared with the American cohort, the aggregated Asian cohort “. . .



showed more agreement that fat babies were unhealthy. Participants with low body appreciation showed more disapproval for fat babies. Angry response and disagreement with the message caused respondents to reject health recommendations.” The report concluded that the majority of respondents were aware that “bigger is not better and that obese babies are not healthy.” Respondents who were urban and educated, both American and Asian, seemed most aware of the health implications obesity in infancy.

In the United States obesity is an important public health problem that cuts across all socioeconomic and racial/ethnic populations. Childhood obesity is of particular concern because obesity prevalence in children from ages 6 through 17 years tripled between 1980 and 2004, although it appears to be plateauing and remaining at a rate of about 17%.^{6–9} Within this general age range, Native American children and those of African and Mexican descent appear to have higher rates than other groupings.¹⁰ These observations are particularly important when viewed in the context of a recent study from Denmark.¹¹ The records from the Copenhagen School Health Registry were examined for all men who attended schools from 1930 to 1989. A subset of 3,373 boys of a total of 62,565 boys was overweight at 7 years of age. At 13 years of age, 3,418 of 62,565 boys were identified as being overweight, and in their early adult years, 5,108 men from the same group of 62,585 were overweight. The percentages of those overweight in these age categories were 5.4%, 5.5%, and 8.2%, respectively. The key finding from this large population study is that boys who were overweight at 7 years of age had a significantly greater risk of type 2 diabetes mellitus in their adult years. Importantly, though, if they reduced their weight before the age of 13 years, their risk was not increased. Notice that the Danish childhood obesity rate is lower than the rate in the United States. The premise that childhood obesity rates are plateauing is supported by a detailed analysis of weight change in pooled data collected from 128.9 million persons 5 years and older, obtained from 2,416 worldwide population-based reports.¹² These databases covered the years 1975 to 2016. In addition to reflecting plateauing overall, this comparative analysis revealed that nutritional changes in areas that usually have been characterized by underweight children (ie, the Caribbean, East Asia, and Latin America) can rapidly lead to children being overweight. Sweden, a country with highly reliable health statistics, also has a plateauing of childhood obesity.^{13,14}

What Is Baby Fat and What Is Its Function?

About 15% of a typical baby's weight at birth is fat, a larger proportion than in any other mammalian species.¹⁵ Guinea pigs are the closest at about 11%, and chimpanzees are not even close at around 3%.^{15,16} Ninety-five percent of baby fat is subcutaneous white adipose tissue. The remaining 5% is brown adipose tissue (aka brown fat or BAT). BAT is crucial for the regulation of body temperature in all neonatal mammals. Unlike some mammals, humans do not regulate their body temperature through shivering; therefore, BAT is especially important because it aids in the burning of white fat. Overall, baby fat serves as an energy sink or buffer. Breastfeeding alone does not provide sufficient nutritional energy to support the rapid brain growth and overall development characteristic of these early years. The physiologic and functional significance of BAT is exceedingly complex. Readers interested in learning more about BAT should review the comprehensive monograph by Cannon and Nedergaard from the Wenner-Gren Institute in Stockholm.¹⁷ Here are a few highlights: (1) BAT in mammals is associated with uncoupling protein 1 (thermogenin); (2) norepinephrine, by binding to β_3 -adrenergic receptor sites on brown adipocytes, releases thermogenin, thereby causing thermogenesis; (3) stimulation of α_2 -adrenergic receptors inhibits thermogenesis; (4) norepinephrine regulates the expression of the thermogenin gene and inhibits apoptosis in brown adipocytes; (5) the in utero human fetus does not use its BAT; (6) the disappearance of BAT correlates negatively with increasing size, perhaps more than with increasing age; and (7) there is now some evidence that white adipose tissue in adults contains residual islets of brown adipocytes along with uncoupling protein 1 mRNA.

Support for the role of BAT in thermogenesis is present in a small sample study of Jamaican children.¹⁸ When 12 malnourished children, 4 to 12 months of age, were exposed to cold, their resting and rectal temperatures failed to increase. Once they were adequately nourished, their thermogenic responses normalized. In an additional study reported in the same article, interscapular BAT from 13 deceased malnourished infants (1–2 years of age) was compared to the BAT taken from 15 adequately nourished deceased infants. Lipid depletion was only found in the former subset.

Finally, I wish to return to the role of cultural attitudes as determinants of childhood obesity and focus on one notably extreme illustration from the African nation, Mauritania. Demographics from Mauritania raise many

questions about childhood obesity. Mauritania has a population that approaches 4 million. It gained independence from France in 1960. Less than 10% of its current population is older than 54 years.^{19,20} The largest age grouping is between 25 and 54 years, and women outnumber men. The estimated life expectancies for women and men are 65.8 and 61.1 years, respectively; both figures have been increasing during the past decade. Mauritania is a stark example of the relationship between culture and childhood obesity, especially for young girls. For adult women, obesity is quite prevalent. One well-accepted reason for this is that in some areas of the country being a large woman is the beauty standard; being thin is considered unhealthy.^{20,21} In general, Mauritanian men are not overweight. Abigail Haworth wrote a piece in 2011 for the monthly international magazine *Marie Claire*.²¹ Although originating in France, *Marie Claire* is now published in many countries and languages. Haworth makes this bold and somewhat sensationalized statement: “In Mauritania, where big is beautiful and stretch marks are sexy, young girls are brutally force-fed a diet of up to 16,000 calories a day — more than four times that of a male bodybuilder — to prepare them for marriage.” She presents the story of a young girl who was sent on vacation in the desert by her mother to “. . . meet other girls and eat sweet food. . . [and] by the time. . . [you return home you will be]. . . a beautiful woman.” Haworth also quotes a 50-year-old woman: “The aim is to feed them until their bodies blow up like balloons.” This same woman is paid 55,102.50 Mauritanian ouguiyas, the equivalent of US\$155, for each girl she force-feeds over a 3-month period. The main weight-producing food is a ball made from dates, peanuts, couscous, and oil. The girls eat about 40 of them per day and drink large amounts of goat’s milk and gruel. She sometimes has to force girls to eat this diet by beating them or torturing them by “. . . squeezing a stick between their toes.” This whole process is called leblouh, and it is usually coupled with early marriage for girls (12-14 years of age). Haworth also quotes a husband who says he does not like “sleeping with a bag of bones” and also mentions a woman who died while pregnant after ingesting animal hormones to have a fat baby. A spokesperson for the current Mauritanian government said to Haworth that leblouh and female obesity are not condoned but acknowledged that the practice still goes on in certain areas. Mauritania is the only country known to force-feed girls, although nomadic tribes often believe that weightier women are healthier. There are no recent estimates of the number of girls in Mauritania who are force-fed; a turn-of-the-21st-century survey placed the figure at 10% for girls younger than 19 years.^{22,23} In addition, many adult women regularly take appetite-stimulating medications, such as certain antihistamines and animal steroids, to be more pleasingly plump. It should be noted that Mauritania is not the only country where overweight women are preferred.²⁴ Others include Afghanistan, Fiji, Jamaica, Kuwait, Samoa, South Africa, Tahiti (where some young women are still deliberately fattened, a practice called ha’apori), Tonga, and Nauru (which has the highest per capita rate of diabetes in the world).²⁴ A key reason for considering weight in adult women is that maternal weight gain during pregnancy is positively correlated with birth weight.²⁵ It should also be noted that undernourishment, especially during the first trimester of a pregnancy, may lead to underweight newborns.²⁶

For this issue, Dr Jill Maron, our Topic Editor for Youth and Children, has assembled articles that focus on childhood obesity.^{27–32}

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Bucci-Rechtweg C. [Enhancing the Pediatric Drug Development Framework to Deliver Better Pediatric Therapies Tomorrow](#)

Gwara M, Smith S, Woods C, Sheeren E, Woods H. [International Children's Advisory Network: A Multifaceted Approach to Patient Engagement in Pediatric Clinical Research](#)

Turner MA, Attar S, de Wildt SN, Vassal G, Mangiarini L, Giaquinto C. [Roles of Clinical Research Networks in Pediatric Drug Development](#)

Turner MA, Hirschfield S. [Frameworks for Evaluating Medicines in Children](#)

Davis JM, Baer GR, Portman R, Nelson R, Storari L, Aranda JV, Bax R, et al. [Enrollment of Neonates in More Than One Clinical Trial](#)