



## Nutrition for Catch-up Growth in Young Children

According to the 2020 edition of the UNICEF-WHO-World Bank Joint Child Malnutrition Estimates, undernutrition remains a global concern.<sup>1</sup> In 2019, 144 million children under the age of 5 were affected by stunting and 47 million by wasting.<sup>2</sup> Particularly in South Asia, nearly 2 out of 5 children had stunted growth and more than half of all wasted children worldwide lived there.<sup>1</sup> Poor growth and undernutrition are associated with an increased risk for infection, impaired cognitive ability, as well as reduced school and work performance.<sup>3-6</sup>

### Healthy Growth

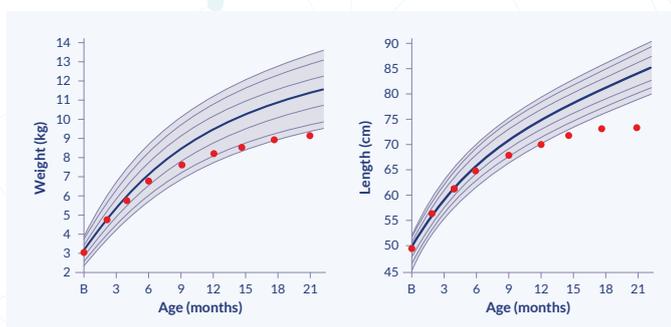
Normal growth is one of the best indicators of a child's overall health and wellbeing.<sup>7</sup> It can impact organ formation and function, the immune system, physical health, and neurological and cognitive development.<sup>8</sup> Adequate nutrition, which includes an appropriate intake of energy, protein, lipids, and micronutrients, is a prerequisite for healthy growth.<sup>8</sup> During their early years, infants and young children have greater nutritional needs to meet in order to provide the "building blocks" for rapid growth.<sup>9</sup> The nutrients they consume are assimilated, transported, and synthesized into newly produced tissues.<sup>9</sup>

In addition, physical health and growth are essential to support early brain development.<sup>10</sup> The preschool years are a time of dramatic biological brain development<sup>10</sup> with 90% of a child's brain development occurring before the age of 5.<sup>11</sup> Therefore, early life is a critical foundational period to establish the basis for lifetime brain function.<sup>11</sup>

### Defining Growth Concerns

"Growth faltering" refers to a pattern of slower weight gain than is expected for a child of a certain age and gender,<sup>12</sup> or a failure to grow at a normal rate that is comparable to the child's peers.<sup>13</sup> It can be observed as a downward trajectory of growth velocity with the resultant growth curve crossing standard deviation (SD) lines or percentiles, as shown in the examples of growth curves below (Figure 1).<sup>7,12</sup>

**Figure 1:** Examples of faltering growth trajectories for weight and length.

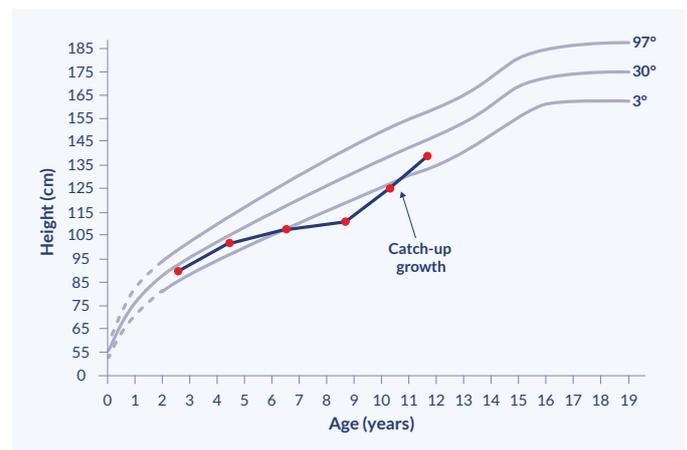


The most common cause of poor growth is inadequate intake of energy, protein, and micronutrients, which can result from disease- or non-disease-related factors.<sup>14</sup> When suffering from an illness or disease, children can experience decreased dietary intake, increased nutritional requirements, and/or increased nutritional losses. When no apparent illness or disease is present, inadequate intake can result from factors such as poor appetite regulation, oral-motor dysfunction, sensory hypersensitivity, or neophobia (fear of new foods).<sup>14</sup>

### Nutrition to Support Catch-up Growth

By providing the right nutrients and correcting deficits, growth can be improved. This is often referred to as catch-up growth (Figure 2).<sup>15</sup>

**Figure 2:** Rapid growth helps the child return to a previous growth centile or a more optimal growth curve.<sup>8,16</sup>



### NUTRIENTS THAT SUPPORT PHYSICAL GROWTH

To ensure catch-up growth, a child's energy and protein intake must be optimized such that both their age-based requirements and need for supplemental calories are taken into account. Protein metabolism and incorporation into new tissue depend on the digestibility of the protein and its amino acid composition.<sup>17</sup> Protein from animal-based foods (e.g., dairy) are highly digestible. Animal protein sources are considered superior to plant-based protein sources because they contain all of the essential amino acids needed for child growth and development.<sup>17,18</sup>

Micronutrients directly impacting growth include zinc, iron, and vitamin A:

- Zinc plays a role in cellular growth, cellular differentiation, metabolism,<sup>19</sup> and DNA synthesis.<sup>20</sup>
- During periods of growth, the body is highly dependent on iron, which helps deliver oxygen to the body's cells.<sup>19</sup>
- Vitamin A plays an essential role in a large number of physiological functions, including vision, growth, reproduction, hematopoiesis, and immunity.<sup>19</sup>

Meta-analyses have assessed the available clinical evidence and concluded that iron and zinc can help support growth in nutritionally at-risk children.<sup>21-23</sup>



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## NUTRIENTS THAT SUPPORT BRAIN DEVELOPMENT

Nutrition is also one of the factors that regulates prenatal and early postnatal brain development.<sup>11</sup> In early life, while the rapidly developing brain is more vulnerable to a deficiency of nutrients, it demonstrates the brain's greatest degree of plasticity at any point in time.<sup>24</sup> An adequate intake of energy, protein, fatty acids, and micronutrients is essential for the formation of the brain, as it lays the foundation for the development of cognitive, motor, and social-emotional skills, as well as establishes the basis for lifetime brain function.<sup>11</sup> Therefore, nutritional deficiencies during these crucial periods of rapid brain development are likely to affect cognition and behavior throughout childhood and adulthood.

Certain nutrients have been documented to have greater effects on brain development. These nutrients include protein, energy, certain fats, such as long-chain polyunsaturated fatty acids, as well as cholesterol, iron, zinc, copper, iodine, selenium, vitamin A, choline, and folate.<sup>25-28</sup>

## LIMITING DAILY CONSUMPTION OF ADDED SUGARS

Globally, experts recommend limiting daily consumption of free sugars, such as sucrose, for young infants and children.<sup>29-31</sup> Recommendations include avoiding sugar-sweetened beverages and preferably consuming sugar in a natural form, such as lactose, in human milk, milk, or unsweetened dairy products.<sup>31</sup> These guidelines are established to encourage a healthy diet early in life to avoid long-term, negative health effects. High intake of free sugars, particularly sugar-sweetened beverages, in children and adolescents is associated with incidence of dental caries and obesity.<sup>30-32</sup> Furthermore, consumption of sugar-sweetened beverages can adversely influence the development of food preferences and patterns, which begin to form during this period.<sup>31</sup> Recently, the 2020 Dietary Guidelines Advisory Committee recommended that children younger than 2 years avoid all added (free) sugars.<sup>33</sup> The rationale is that nutritional needs are high at this stage; therefore, "every bite counts" and there is no room for discretionary intake.<sup>33</sup>

## Clinical Evidence for Nutrient Dense Supplements and Catch-Up Growth

Intervention strategies designed to address growth faltering include optimizing the child's intake of energy and nutrients, as well as advising parents on their child's feeding and eating behaviors.<sup>12</sup>

Clinical evidence shows that energy and nutrient dense supplements support catch-up growth.<sup>34-39</sup> Several studies demonstrated weight and/or height gain through nutritional intervention and dietary counseling in nutritionally at-risk children.<sup>34-39</sup> The formulations studied in these different trials had an energy density of 0.87–1.08 kcal/mL, a protein-energy ratio of 3–3.5 g/100 kcal, and were fortified with micronutrients.<sup>34-39</sup> The majority of the clinical trials also utilized nutritional counseling. Strategies for counseling include four functional areas: parental feeding style, the child's feeding behaviors and temperament at mealtimes, and psychosocial factors.<sup>13</sup>

### Key Takeaways

- Normal growth is one of the best indicators of a child's overall health and wellbeing.
- "Growth faltering" refers to a pattern of slower weight gain than is expected for a child's age and gender, or a failure to grow at a normal rate that is comparable to the child's peers.
- The most common cause of poor growth is inadequate intake of energy, protein, and micronutrients, which can result from disease- or non-disease-related factors.
- Energy and protein are critical for catch-up growth, which must take a child's baseline requirements into account, as well as the additional calories and protein they need for new tissue synthesis.
- Micronutrients directly impacting growth include zinc, iron, and vitamin A. Supplementation of these micronutrients have been shown to positively impact growth in growth-restricted children.
- Globally, experts recommend limiting daily consumption of free sugars, such as sucrose, for young infants and children.
- In studies of nutritionally at-risk children, the use of nutrient dense oral nutrition supplements, coupled with dietary counseling, demonstrated weight and/or height gain. The oral nutrition supplements had an energy density of 0.87–1.08 kcal/mL, a protein-energy ratio of 3–3.5 g/100 kcal, and were fortified with micronutrients.

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