Conceptualizations of Child Development Benefit from Inclusion of the Nurturing Care Framework

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Over 250 million children under age 5 y in low- and middle-income countries are at risk of not reaching their developmental potential, resulting in long-term negative consequences that undermine subsequent health, well-being, and productivity (1). The loss of developmental potential is a global crisis that has led to calls for action from leaders of international agencies (2) and recommendations for the Nurturing Care Framework to serve as a model for the care and services that promote young children's healthy growth and development. The Nurturing Care Framework includes policies, programs, and services that create an enabling environment for families and communities to ensure that their children receive health care, adequate nutrition, responsive caregiving, opportunities for early learning, and safety and security (1).

In this issue of *The Journal of Nutrition*, the Malnutrition and Enteric Disease (MAL-ED) study authors make a unique contribution by systematically examining how enteric pathogens, nutrition, and the home environment during the first 2 y of life relate to children's development at age 5 y across multiple low-income sites in Africa, Asia, and South America (3). A study conducted when the children were age 2 y found that they experienced high rates of adversities during the first 2 y of life, including monthly detection of enteropathogens in nondiarrheal stools, frequent illnesses, and low micronutrient intakes (4). Enteropathogens, mediated by frequent illnesses and low hemoglobin concentration, were associated with low cognitive skills at age 2 y, suggesting that the malnutrition–enteric infection cycle, which has been associated with poor health and is exacerbated by oral–fecal contamination often found in unhygienic environments (5), extends to children's cognitive development.

In the current study (3), cognitive development was measured by the Wechsler Preschool and Primary Scale of Intelligence, Third Edition (WPPSI-III), which was developed and normed in the United States (6). As recommended, the investigators addressed cultural and linguistic issues across sites through adaptations and excluding verbal subtests from the analysis. Using statistical procedures at the item level to examine measurement equivalence across sites, they identified 3 subtests (block design, matrix reasoning, and picture completion) classified as fluid reasoning, resulting in sample-derived scores. Fluid reasoning, the capacity to think logically and to solve problems in novel situations, does not depend on acquired knowledge (7). In contrast, crystallized intelligence, a measure of intellectual achievement often including verbal subtests such as vocabulary and general knowledge, is responsive to environmental variation. The 2 systems operate together, but are thought to represent differing specialized neural systems (8), meaning that each system describes unique aspects of intelligence.

At age 5 y, children's cognitive development was associated with 3 measures from the age 2 y data collection: transferrin receptor (a carrier protein that transports iron into the cell and serves as a measure of iron status), household cleanliness, and maternal education and reasoning. One possible explanation for the finding that enteropathogens, other infections, illnesses, and complementary feeding before age 2 y were not related to cognitive development at age 5 y may be that the exposures did not undermine the aspects of children's brain development related to fluid reasoning. It is unknown whether the early exposures compromised children's crystallized intelligence at age 5 y. Some evidence for the differential relation between early nutrition and subsequent cognitive development is derived from a longitudinal study of well-nourished children in the United Kingdom that examined whether WPPSI-III scores at age 4 y varied between children with a diet of fruit, vegetables, and home-prepared foods at ages 6 and 12 mo and children with a less healthy diet as infants (9). After covariate control, children with a healthy infant diet had significantly higher WPPSI-III scores on full-scale and verbal intelligence at age 4 y, but not on a test of fluid intelligence or other measures of cognitive and neuropsychological functioning, suggesting that fluid intelligence may be less reactive to early nutritional variability than is crystallized intelligence.

In the MAL-ED study, growth was not included in the authors' conceptual model and there were no reports of height-for-age *z* score or stunting at either age 24 or 60 mo. A finding of catch-up growth in height after 2 y may have suggested improvements in children's health and nutrition during the preschool years that could have been protective for cognitive development. Another possibility is that environmental improvements during the 3 y of the study follow-up enabled children to recover from the effects of early enteric infections and illnesses. For example, interventions to alleviate poverty-related effects on children's development can be mediated by nurturant and responsive home environments

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(10–12). However, without information on the children's nutritional status, health, or home environment during the preschool period (2–5 y), these possibilities cannot be evaluated. A final possibility is that children's development is more closely associated with learning opportunities and responsive caregiving than with household cleanliness, as suggested by a recent randomized controlled trial to improve household water, sanitation, and hygiene that had little impact on children's development (13).

The first 1000 d are foundational for lifelong health and well-being. During this period of rapid growth and brain development, children are vulnerable to adversities that can dysregulate their development with long-term consequences, as illustrated by the lasting relations with iron deficiency in the MAL-ED study (14). Although ensuring children's health and nutritional adequacy can promote their growth and development, health and nutrition alone may not be sufficient if children do not experience the learning opportunities, responsive caregiving, and security and safety that are part of the Nurturing Care Framework (1). Young children receive nurturing care primarily in the home, supported by enabling environments that extend from families to include community programs and services, along with national child- and family-friendly policies (10).

In many countries, the preschool period (age 2–5 y) represents a gap in both monitoring and services (11). Health care visits are relatively infrequent after infancy and the routine immunization schedule, and primary education does not generally begin until age 5 or 6 y. The MAL-ED study included an indicator for day care or preschool attendance, but duration and frequency of attendance were not included in the model. Global increases in maternal employment have been accompanied by increases in child care programs for young children. A recent study using nationally representative data from 63 low- and middle-income countries found that one-third of children age 3–4 y attended center-based early child care and education programs (15). Quality and consistency of attendance varied, suggesting that future studies of early childhood development should examine the frequency of attendance and quality of early child care programs.

In summary, the MAL-ED study made major contributions to our understanding of early childhood development through their systematic multisite procedures and their finding of persistent relations between early life household cleanliness and assets, maternal reasoning and education, and children's iron status with cognitive development at age 5 y. Although the sites included multiple poverty-related threats resulting in enteric infections and illnesses before age 2 y, associations with cognitive development were not sustained to age 5 y. Expanding conceptual models of child development to include the 5 components of the Nurturing Care Framework and examining whether responsive caregiving and early learning can mitigate the impact of early adversities can advance our understanding of the mechanisms underlying child development in low- and middle-income countries.

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