



# Rethinking water, sanitation, and hygiene for human growth and development

**The identification of age appropriate biological outcomes and WASH indicators, while anticipating the timing of life-course suitability of the interventions being operationalised**

Conditions in early life can lead to long-term consequences for health and wellbeing. It is therefore important to protect and support growth and development during this time by reducing risks of exposure to infectious diseases, optimising infant nutrition, and stimulating and supporting cognitive and emotional development to avert both short-term (stunting, cognitive functioning) and long-term (non-communicable diseases, human capital) consequences. Links between human growth and development to water, sanitation, and hygiene (WASH) are evident in the UNICEF Conceptual Framework, as well as numerous studies linking WASH and nutritional status, and maternal and child health. These studies have helped summarise the knowledge, gaps and actions needed to reduce infant morbidity and mortality, favouring, amongst others, linear growth/normal growth. Unfortunately, recent findings, evaluating progress made in addressing maternal and child undernutrition have highlighted the lack of progress utilising low-cost water and sanitation interventions on child growth, suggesting that more complex pathways, including the role of environmental enteric dysfunction, and associated chronic inflammation are important factors contributing to persistent growth faltering.

Studies and reports continue to stress the importance of WASH, particularly during the first 1000 days, which demands a shift in how we think about WASH interventions.

## Health Outcomes and Intervention Timing

How and when maternal and child biology respond to interventions is a critical point to consider when thinking about optimising and appropriately targeting WASH interventions. Different developmental outcomes in early childhood may be responsive to different stimuli at different ages. The WASH sector needs to re-evaluate its approach for how best to operationalise WASH in service of optimised childhood growth and development, starting with rethinking which health outcomes to consider in the first 1000 days, while remaining mindful of children's biological disposition, and identifying circumstances and relevant WASH indicators sensitive to augmentation.

A recent study in South Africa exploring the effect of early life exposures related to specific WASH risk factors and nutritional status between birth and one year of age, highlighted that various WASH components have differentiated effects at different ages. The biggest impact relating to water was seen to affect weight-for-age (WAZ) around 12 months postpartum, while the greatest impact of hygiene was seen around 1 month postpartum and affected height-for-age (HAZ) and WAZ. Access to safely managed sanitation facilities was critical throughout the first year, and impacted HAZ, WAZ, and weight-for-height (WHZ). This may be indicative of WASH factors, such as sanitation, having a



greater impact on weight, rather than height, during this period of early childhood growth.

We suggest that interventions targeting WASH should, track changes in fat levels throughout infancy and childhood. This results from changes in the environment causing short term adaptations with long term consequences.

In addition, there is an energy trade-off between growth in height and brain growth during infancy and childhood are made in response to environmental stimuli to protect the growth and development of the brain. Undernutrition in infancy and childhood, and its relative resultant energy deficiency, may therefore trigger adaptive physiological mechanisms prioritising brain growth at the expense of body growth.

There is increasing interest in the hypothesis that WASH interventions may improve, not only growth, but also neurodevelopmental outcomes. The potential impact of WASH on neurocognitive development is suggested to operate through multiple interlinked pathways, including effects on malnutrition, enteropathy, and infection. Poor cognitive, sensorimotor, and socioemotional development are hypothesised to be mediated, in part, through anaemia of chronic disease and stunting, resulting from poor gut health and chronic immune stimulation, in addition to other well-established causes of developmental deficits. Furthermore, WASH may modulate the composition and function of the gut microbiota, thereby also influencing brain development through the microbiota–gut–brain axis. The complexity and heterogeneity in the effects on neural development suggests that a central focus on neural development is required.

For brain growth and neurodevelopment, key developmental stages and milestones should be monitored during infancy and childhood as well as brain growth. For length/height, the first 2 to 3 years is the key period as plasticity is at its peak, after which, length/height is canalised. The benchmark to which the success of WASH interventions should be measured in the first 5 years and pre-pubertal period should therefore be brain growth and development.

## Conclusion

WASH is a complex concept, with many components, both individual factors (water, sanitation, and hygiene), as well as within each factor (quality, quantity, access, infrastructure, etc.) all interacting in various environments and at different scales. This highlights the importance of selecting which components and factors are relevant for specific growth and development outcomes to enhance interventions in various contexts, at specific stages in early childhood development.

WASH cannot be the sole solution for solving all the problems relating to childhood growth and development, rather the development of transformative WASH interventions and studies should seek to maximise return on investments by targeting precise growth and developmental outcomes at specific ages. Interventions intending to address issues surrounding WASH in early childhood in service of optimised growth and development would benefit from taking timing into account and identifying specific timeframes in early childhood, and associated WASH factors for intervention.

## Reference:

### Rethinking water, sanitation, and hygiene (WASH) for human growth and development

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