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WASH for Human Development

Can Scaling Up Water Supply, Sanitation, and Hygiene (WASH) Interventions Help Children Grow in Tanzania?

BRIEF

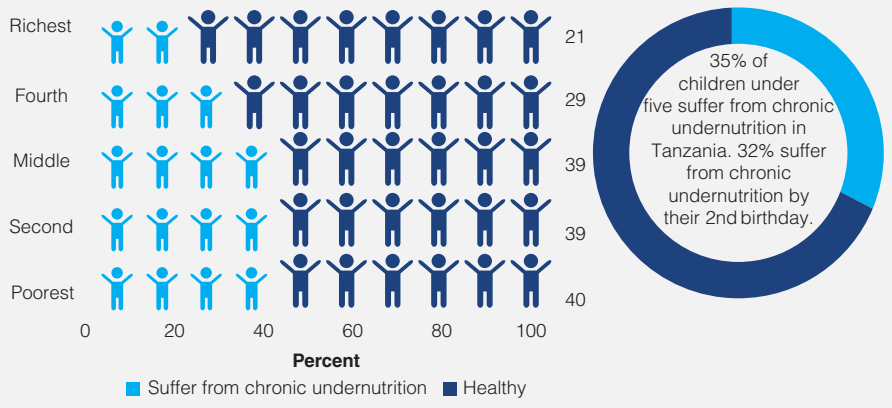
September 2017

Background

In Tanzania, about a third of children under five suffer from chronic undernutrition, as indicated by their low height-for-age or stunted growth. Stunting is a marker of suffering from chronic undernutrition in which a child is not getting enough nutrients to properly grow and develop. The consequences of chronic undernutrition are largely irreversible, debilitating not only a child's physical stature but also his or her mental capabilities, health, immunity, and even earnings later on in life. Chronic undernutrition is prevalent in the whole population, even the richer quintiles (figure 1). However, chronic undernutrition and poverty are strongly linked. Children living in the poorest households are most likely to suffer from chronic undernutrition. To end poverty and promote shared prosperity in Tanzania, policy makers will need to prioritize strategies aimed at reducing the country's unusually high undernutrition rates.

This brief highlights recent analyses from the *Tanzania WASH Poverty Diagnostic* (TWPD) on trends in undernutrition over the years and among income groups. The analysis also identifies key drivers of high chronic undernutrition rates across regions and population groups of Tanzania. The findings should help guide policy makers from the health and water sectors on how to better design programming that aims to be "nutrition-sensitive" in practice.

Figure 1: Proportion of Children under Five Suffering from Chronic Undernutrition in Tanzania by Wealth Quintiles



Source: DHS 2016.

HIGHLIGHTS

- Tanzania suffers from high rates of chronic undernutrition, which is currently at 35 percent. Even among the richest quintile, one in five children suffer from chronic undernutrition. Despite robust economic growth the country experienced moderate reductions in chronic undernutrition in the past 20 years. Between 1996 and 2015, there was a 14 percentage point drop in chronic undernutrition among children under five.
- Poor WASH environments can interrupt healthy childhood development by increasing a child's risk of contracting enteric infections. The country's minimal improvements in WASH access could be one of the contributing factors for the slow decline in chronic undernutrition.
- High prevalence of unimproved sanitation in the community and low prevalence of handwashing with soap are found to be some of the most important WASH-related drivers of high chronic undernutrition.
- Ensuring adequacies in WASH seem to have large synergizing effects with other nutrition-related factors such as food and care practices in improving nutrition. The health sector can work to garner support from other sectors to converge various interventions to areas that have high levels of chronic undernutrition.

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Trends in Undernutrition

An estimated 2.7 million children in Tanzania suffer from chronic undernutrition, making the country home to the third highest population of children who suffer from chronic undernutrition in Sub-Saharan Africa, just after Ethiopia and the Democratic Republic of Congo. Though the country has laudable achievements in improving other health indicators, such as reducing infant and child mortality, Tanzania was not able to meet its Millennium Development Goal (MDG) target on nutrition by 2015. From 1996 to 2014, chronic undernutrition prevalence was reduced from 49 percent to 35 percent. In other indicators of undernutrition, 11 percent, 14 percent, and 5 percent of children under five are extremely stunted, underweight, or wasted, respectively.[1] Some key trends on chronic undernutrition are summarized below.

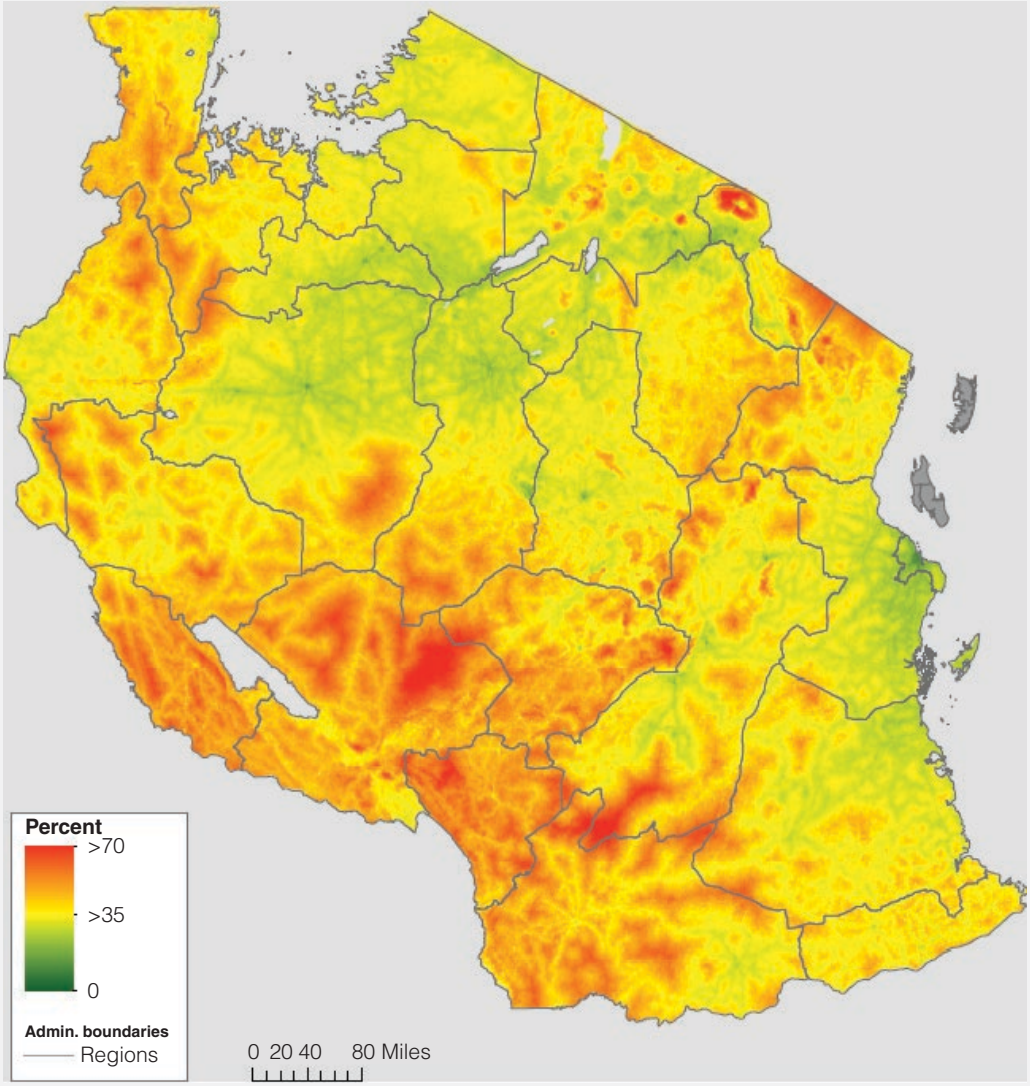
- **The prevalence of chronic undernutrition in the poorest quintile of the national wealth distribution is almost twice as high as in the richest quintile (40 percent compared to 21 percent, respectively).** However, a 20 percent prevalence is relatively high even for richer populations, indicating that there are larger environmental, dietary, feeding, and social factors aside from wealth that are contributing to the undernutrition problem.
- **By gender, boys consistently have the highest prevalence of undernutrition across stunting, underweight, and wasting indicators**. Boys have a chronic undernutrition prevalence of 37 percent compared to 32 percent for girls. Social norms and cultural practices could be an underlying factor for these differences.
- **Rural children are more likely to suffer from chronic undernutrition compared to their urban counterparts (37 compared to 26 percent, respectively).** Children living in urban areas may have better access to food, health services, and coping mechanisms that make them least likely to be chronically undernourished. Wealth most likely also plays a role in explaining this difference.
- **Geospatial mapping reveals that chronic undernutrition rates are highest in the southwestern area of the country.** This area is also known to have the highest incidence of poverty in the country. As map 1 shows, there are some pockets with 50 percent to 80 percent chronic undernutrition. At an aggregated regional level, the Njombe and Rukwa regions have the highest prevalence of chronic undernutrition, in which up to half of all children under five are chronically undernourished.
- **By age group, the prevalence of chronic undernutrition sharply increases after a child is six months old.** For the 0- to 6-month age group, chronic undernutrition is about 14 percent, whereas it is 33 percent for the 6- to 24-month age group. This could be due to different growth spurts related to age or could reflect different feeding practices or the way a child interacts with his or her environment.

Pathways to Chronic Undernutrition

Chronic undernutrition arises from two immediate causes: inadequate dietary intake and disease (figure 2). Children need a high nutritious diet to get the energy they need to grow, but suffering from any disease, at the same time, can divert that needed

1. Stunting measures height and age, in which a child is considered to be stunted if he or she has a height-for-age z-score (HAZ) 2 standard deviations (SDs) below the World Health Organization (WHO) reference population. Extreme stunting is indicated by 3 SDs below the HAZ. Stunting marks chronic undernutrition. Underweight measures weight and age, in which a child is considered underweight if his or her weight-for-age z-score (WAZ) is −2 SD from the WHO reference population. Wasting measures weight and height, in which a child is considered wasted if his or her weight-for-height z-score (WHZ) is −2SD from the reference population. Underweight marks acute undernutrition, whereas wasting measures extreme acute undernutrition.

Map 1: Proportion of Children under Five Suffering from Chronic Undernutrition, Tanzania, 2016

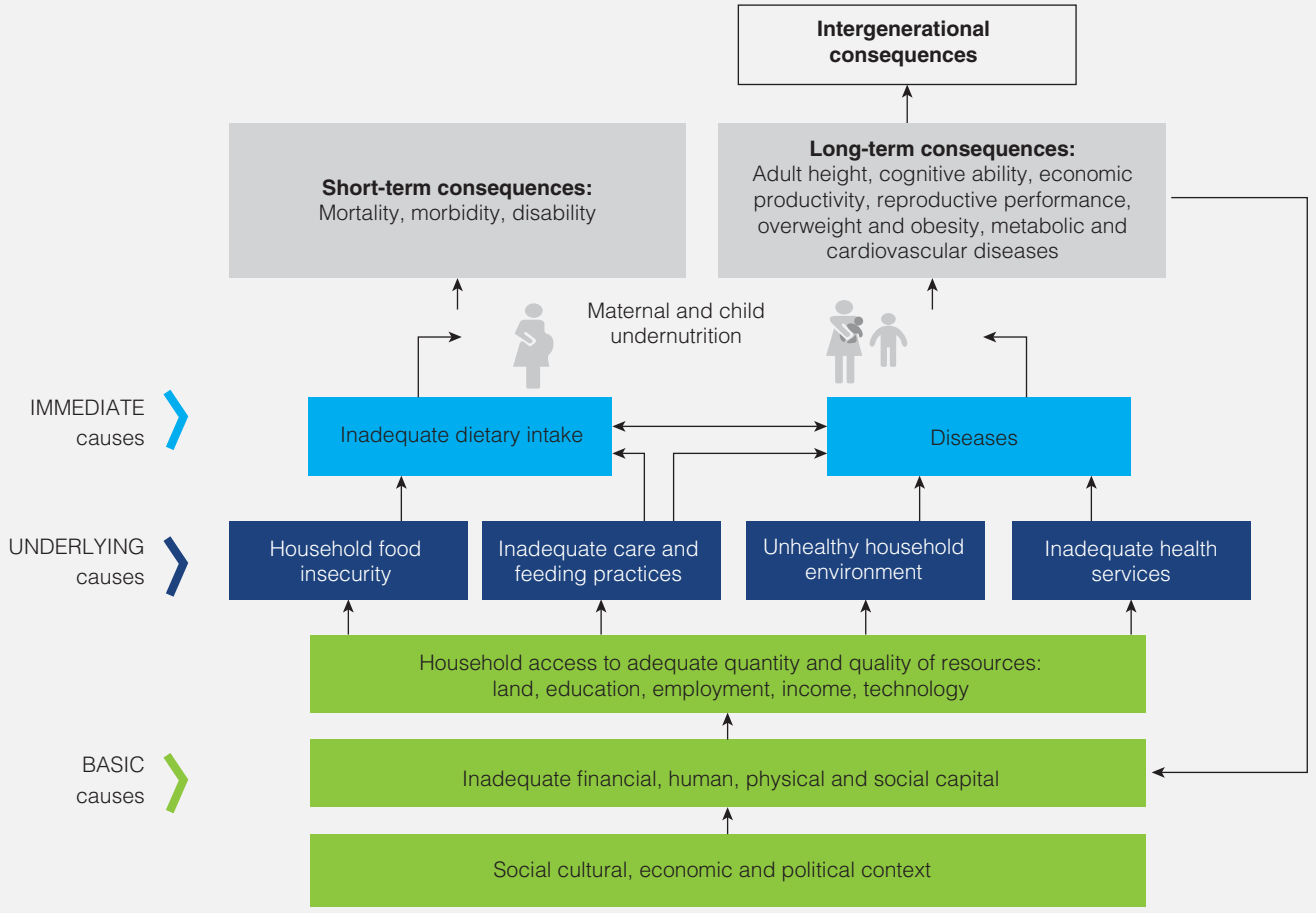


Source: DHS 2016.
Note: Map is at 5x5 km^2 pixel-level.

energy to fighting off sicknesses rather than healthy growth and development. In some instances, disease can actually change a child's metabolism, in which a child cannot even digest essential nutrients for growth. The underlying causes of poor dietary intake and disease include factors such as food insecurity, access to health services, care practices such as breastfeeding, and even WASH environments, the focus of our discussion.

The scientific linkages between inadequate WASH and poor health and nutrition outcomes have been long established in the literature; however older evidence primarily accounts for WASH impact through its acute effect in causing sudden bouts of diarrheal disease, expelling essential nutrients from the body at just one given point in time (Humphrey 2009).

Figure 2: Undernutrition Framework



Source: UNICEF (1990) "Strategy for Improved Nutrition of Children and Women in Developing Countries," as adapted by authors.

In recent years, researchers have posed new hypotheses on the biological mechanisms of WASH impact on chronic undernutrition. The most recent hypothesis is that inadequate WASH causes environmental enteric dysfunction (EED), a chronic malformation of the gut induced by repeated exposure to fecal bacteria (Humphrey 2009). If a young child develops EED, he or she is unable to *absorb* the essential nutrients needed to properly develop and grow, which can be manifested by chronic undernutrition. Those with EED may not display any other signs of enteric infections, such as diarrheal disease, which makes the condition difficult to diagnose. Researchers are still trying to find the best ways to detect EED at early stages to save children from its most extreme impact, chronic undernutrition.

In addition to diarrheal disease and EED, other WASH-related diseases such as hookworm infections or malaria can directly lead to risk factors of undernutrition. There are also several indirect pathways of WASH that could contribute to poor health and nutrition outcomes. For example, the time needed to collect water could divert household members from productive activities such as caring for children or going to school or work. A simple lack of toilets in schools for girls has been shown to increase the likelihood of adolescent girls missing or dropping out of school. Education levels and care practices of mothers are directly correlated to nutrition outcomes (Ngure et al. 2014).

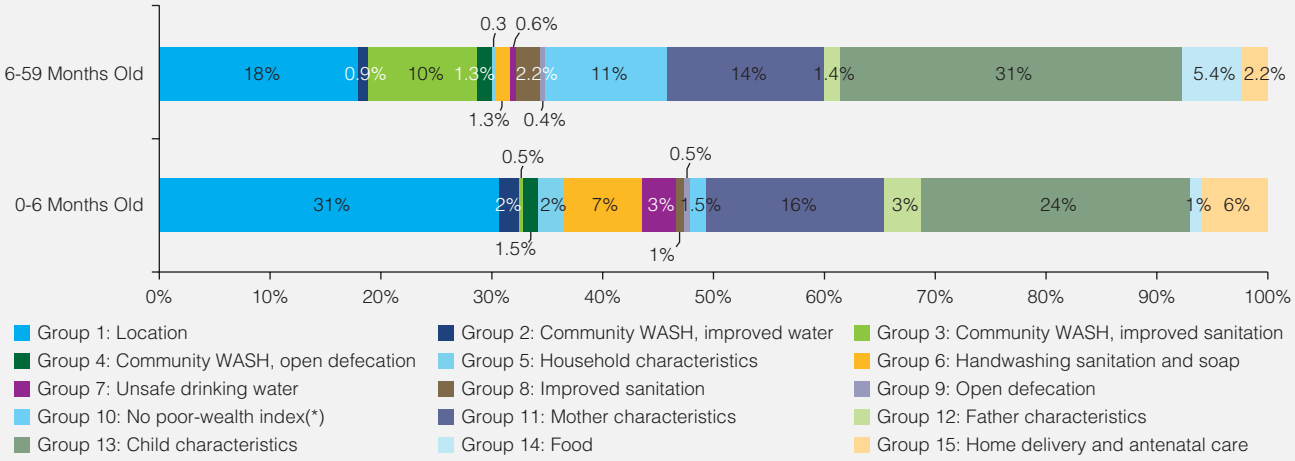
WASH-Related Drivers of Chronic Undernutrition in Tanzania

So what are the biggest WASH-related risk factors for chronic undernutrition in the Tanzanian context? To answer this question, the TWPD team undertook econometric analysis using 2016 Demographic and Health Survey (DHS) data of 4,910 children under five. The analysis considered multiple risk factors associated with stunting, primarily focusing on WASH-related factors. The selected variables[2] used in the Shapley decomposition[3] include location (e.g., urban or rural, regions), household characteristics (e.g., electricity, roof, number of children), home delivery and antenatal care, child characteristics, characteristics of the mother and father, household wealth, and WASH variables (e.g., community-level water and sanitation access,[4] household-level water and sanitation access, and handwashing with soap).

The results indicate that overall WASH variables do have a significant value in explaining observed chronic undernutrition in Tanzania (figure 3). Community-level sanitation seems to be the most important WASH variable, meaning that communities that have a higher proportion of households without access to improved sanitation could significantly explain children's chronic undernutrition rates. A complementary TWPD analysis shows that communities must reach at least a 24 percent threshold of improved sanitation coverage to see any effects in chronic undernutrition reductions. Handwashing also has a significant effect. This means that chronic undernutrition could be partially explained by whether a household does not have access to a handwashing station with available soap. When examining these effects by different age groups, we conclude that handwashing may have the most significant effect for infants aged 0–6 months, while community-level sanitation is most important for children aged 6–59 months. This difference could shed light to the most important fecal-oral pathways for different age groups. For example, handwashing with soap could be a significant risk factor because of the importance of caregiver hygiene in preventing direct fecal exposure to their babies. While for children aged 6–59 months, community-level sanitation could be important due to the likelihood for older children to be more active in their environment. Improved water access at both the community and household levels does not seem to have a huge effect in explaining chronic undernutrition. This is most likely an issue of whether access to improved water is a valid proxy for *clean* water access. In experiences in Tanzania and other low-income countries (LICs), researchers are now seeing that many improved water sources do not actually tap water that is of good water quality. Emerging evidence suggests that high bacterial contamination of drinking water can also lead to poor nutritional outcomes (Dangour et al. 2013). However, due to the lack of data, water quality could not be considered in this analysis.

2. Other significant risk factors related to nutrition could not be included in the model. For example, food security, vitamin A supplementation, and breastfeeding could not be added to the model due to data limitations. As a result, the selected factors can explain only 12 percent of observed chronic undernutrition, as indicated by stunting. The results of WASH-related risk factors in the model should not be interpreted by their value weights, but instead can help policy makers prioritize WASH interventions in nutrition-sensitive programming.
3. Shapley decomposition is an econometric technique that breaks down the contribution of certain variables in explaining an observed outcome.
4. Community-level water and sanitation considered three variables: (a) proportion of households in the community (15–20 households per community) practicing open defecation; (b) proportion of households in the community with access to improved sanitation facilities; and (c) proportion of households in the community with access to improved water. Improved water and improved sanitation follow the WHO/UNICEF Joint Monitoring Programme (JMP) standards for water and sanitation facilities that can theoretically by nature of construction protect an individual from having contact with fecal matter.

Figure 3: Shapley Decomposition of Contributors of Stunting, by Age Group



Source: DHS 2016.

Operational and Policy Implications

Researchers across different sectors are advocating for multisectoral strategies in reducing chronic undernutrition (Shekar et al. 2017). In other words, the development community recognizes that no one intervention can solve the undernutrition problem. Given the numerous determinants of chronic undernutrition, a diverse set of actors will need to commit to the nutrition agenda.

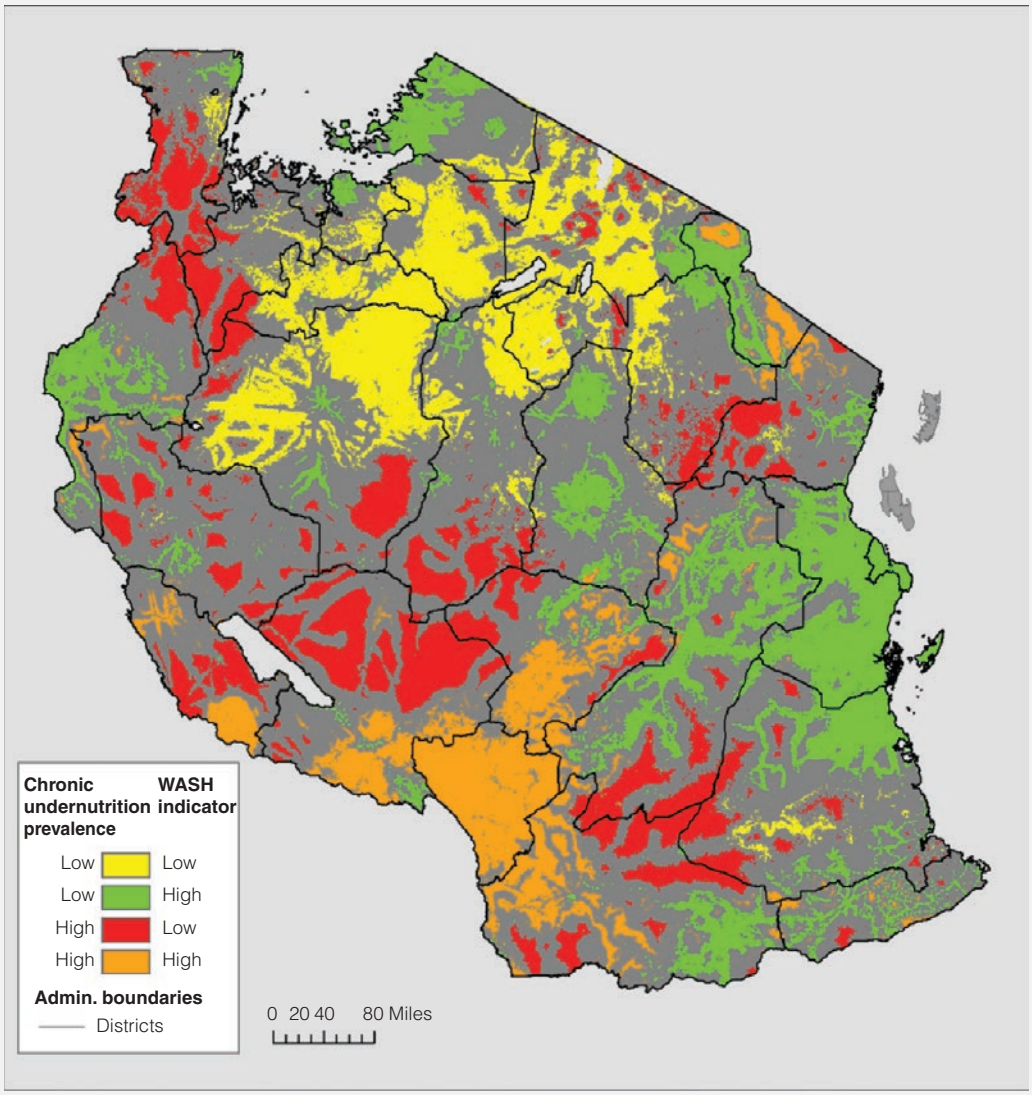
In the case of water and sanitation, policy makers must understand which interventions are the most impactful in reducing risks of fecal contamination. Those integrating WASH into health and nutrition or related programming may want to focus closely on immediate fecal-oral pathways during a child's first 1,000 days. In our analysis, we find that lack of handwashing with soap and lack of community-level improved sanitation seem to be some of the most significant WASH-related drivers of observed chronic undernutrition in Tanzania. Some practitioners are advocating for "Baby WASH" interventions, which aim to prevent fecal transmission from overlooked pathways such as in food, play areas, and contact with caregivers (Ngure et al. 2014). Water and sanitation practitioners can also aim to be more "nutrition-sensitive" in practice by monitoring WASH indicators most related to enteric infections. For instance, monitoring water quality (bacterial contamination of water), fecal sludge management practices, open defecation and hygiene behaviors could be beneficial in ensuring WASH interventions are actually leading to reductions in fecal pollution of the environment. Currently, most WASH projects solely focus on measuring access levels to water and sanitation infrastructure, which are not adequate proxies for measuring the quality and safety of WASH services.

For those practitioners who are not in the position to fully integrate interventions from multiple sectors, convergence of nutrition-specific and -sensitive interventions could be enough (Chase and Ngure 2016). For example, there is evidence to show that WASH interventions have a synergizing effect on chronic undernutrition reductions when combined with other food security and health interventions (Skoufias 2016). This implies that sectors can simultaneously target interventions that are complimentary to each other for meeting nutrition targets. A common

targeting approach for different sectors could be to simply target areas with high prevalence of chronic undernutrition or poverty as these two populations commonly overlap. Map 2 provides an example for the sanitation sector, which is map created by the TWPD team that cross-tabulates chronic undernutrition prevalence and sanitation coverage to identify overlaps in hotspots. The areas in red highlight areas with high chronic undernutrition prevalence and low improved sanitation coverage. Policy makers could prioritize these areas for sanitation interventions.

Reducing chronic undernutrition has not been an easy task for any country, but our knowledge base on drivers of undernutrition is quickly evolving. Making evidence-based policy decisions and employing smarter targeting of interventions can hopefully accelerate progress in ending chronic undernutrition in the near future.

Map 2: Share of Chronic Undernutrition and Sanitation Coverage, Tanzania, 2016



Source: World Bank 2017 elaboration of DHS 2016.
Note: Map shows cross-mapping of chronic undernutrition compared to WASH: share of population using improved sanitation. WASH = water supply, sanitation, and hygiene.

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About the WASH Poverty Diagnostic Initiative

The WASH Poverty Diagnostic is a global initiative that aims to have local impact by understanding the extent to which the social contract for delivering WASH services is working for all—particularly the poor and vulnerable—and if it not, who is not benefiting and why? The initiative ultimately aims to better understand binding constraints in service delivery and search for solutions that are both technically and politically feasible to overcome them. Results from this initiative are intended to be public goods to inform country-level policy dialogue and programming as well as the methods and frameworks for broader consumption by a variety of specialists. The initiative is led by the World Bank's Water and Poverty Global Practices in close collaboration with the Governance and Health, Nutrition, and Population Global Practices. This initiative also collaborated closely with the UNICEF/WHO Joint Monitoring Programme (JMP).

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