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Multisectoral Approaches to Improving Nutrition: Water, Sanitation, and Hygiene

Claire Chase and Francis Ngure

February 2016

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This Technical Paper is conceived as a work in progress to encourage the exchange of ideas about development issues. For more information please email worldbankwater@worldbank.org or visit www.wsp.org.

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Abbreviations

BCC	behavior change communication
CCT	conditional cash transfer
CDD	community driven development
CI	confidence interval
CLTS	Community-Led Total Sanitation
COD	cash on delivery
DAC	Development Assistance Committee
DHS	demographic and health survey
DLI	disbursement linked indicator
GDP	gross domestic product
GPOBA	Global Partnership for Output-Based Aid
HAZ	height-for-age Z-score
HDN	Human Development Network
HIV/AIDS	human immunodeficiency virus/acquired immunodeficiency syndrome
HNP	Health, Nutrition and Population
HRITF	Health Results Innovation Trust Fund
IEG	Independent Evaluation Group
MDG	Millennium Development Goal
MoH	Ministry of Health
OBA	output-based aid
ODF	open defecation free
PDO	project development objective
P4P	pay for performance
PforR	Program-for-Results
PM	practice manager
RBF	results-based financing
SBM	Sawatch Bharat Mission
SDG	Sustainable Development Goal
SHINE	Sanitation Hygiene Infant Nutrition Efficacy Project
STH	soil-transmitted helminthiasis
SUpRWSS	Scaling Up Rural Water Supply and Sanitation Program
TTL	task team leader
UNICEF	United Nations Children's Fund
WASH	water, sanitation and hygiene
WAZ	weight-for-age Z-score
WBG	World Bank Group
WHO	World Health Organization
WSP	Water and Sanitation Program

I. Introduction

KEY POINTS

- Global momentum around emerging evidence of the linkages between water, sanitation, and hygiene (WASH) and undernutrition, and high-level policy dialogue advocating for nutrition-sensitive WASH, has created a "window of opportunity" to influence how the World Bank Group approaches lending for WASH projects, and how policies are designed for greater impact on nutrition.
- Achieving nearly universal coverage of the most effective nutrition interventions in high burden countries would only reduce stunting by 20 percent globally, suggesting a critical role for nutrition-sensitive interventions such as WASH to address the remaining burden.
- Increased use of geographic and demographic targeting of WASH projects can help reach populations where water and sanitation coverage is low and undernutrition is high.
- Incorporating state-of-the-art behavior change methods and insights from behavioral economics into World Bank Group operations in the WASH sector, and documenting behavioral outcomes, can provide plausible evidence of impact on nutrition.
- Institutional levers can be used to align incentives of task teams and senior management toward multisectoral approaches, while results-based incentives can align objectives at the project level.
- WASH interventions can increase nutritional impact by measuring and monitoring outcomes beyond access to services, such as usage, maintenance of infrastructure, and behavioral change.

Undernutrition is estimated to cause 45 percent of all child deaths (Black et al. 2013), and is responsible for 11 percent of the global disease burden (Black et al. 2008). It results in productivity losses[1] to individuals estimated at more than 10 percent of lifetime earnings, and gross domestic product (GDP) losses as high as 2 to 3 percent. Reducing undernutrition is at the core of the World Bank Group (WBG) mission to end poverty. However, nutrition interventions are not sufficient to tackle the problem of undernutrition: even at 90 percent coverage the core set of proven nutrition interventions in high nutrition burden countries would only decrease stunting by 20 percent globally.

[1] Including lost physical productivity, cognitive deficits and school days lost, and lost financial resources due to higher healthcare costs.

Inadequate dietary intake and disease are directly responsible for undernutrition, but there are multiple indirect determinants that exacerbate these direct causes, including food insecurity, inadequate childcare practices, low maternal education, poor access to health services, lack of access to clean water and sanitation, and poor hygiene practices. Political, cultural, social, and economic factors likewise play a role. Given the range of drivers of nutrition—spanning multiple sectors of agriculture, social protection, health, WASH, and education—tackling undernutrition demands a multisectoral response.

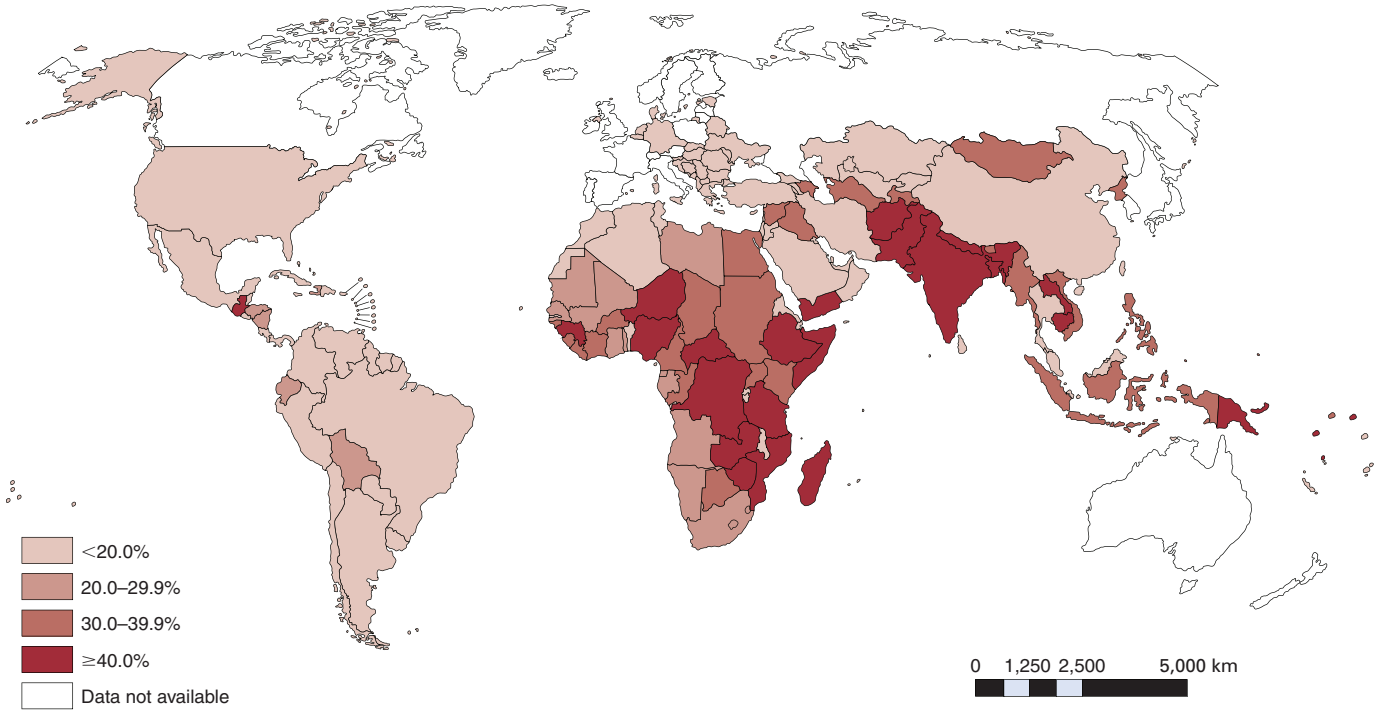
Children who are stunted (having low height-for-age) suffer from a long-term failure to grow, reflecting the cumulative effects of chronic deficits in food intake, poor care practices, and illness. Wasting, defined as low weight-for-height, is the result of recent shocks to lack of calories and nutrients from famine, or a severe and sudden illness. Underweight (low weight-for-age) serves as a composite measure that captures both stunting and wasting. Globally, the prevalence of stunting, wasting, and underweight among children under five years of age in 2011 was 26 percent, 8 percent, and 16 percent, respectively (UNICEF, WHO, World Bank 2012). Undernutrition is associated with severe long-term consequences such as poor cognitive development, lower school attendance, reduced human capital attainment, and potentially a higher risk of chronic disease in adulthood (Victora et al. 2008).

In response to the global development community's request for operational guidance to maximize the impact of investments on nutrition outcomes for women and young children, the Health, Nutrition and Population (HNP) department of the Human Development Network (HDN) commissioned the report, *Improving Nutrition Through Multisectoral Approaches* (Alderman et al. 2013). The report provided the intellectual and theoretical rationale for a multisectoral response to malnutrition and presented a series of self-contained guidance notes for task team leaders (TTLs), World Bank Group staff, development partners, and community implementers responsible for the design and oversight of projects and programs in agriculture, social protection, and health. The overall aim of the report was to mainstream nutrition activities into multisectoral action (Alderman et al. 2013).

Water, sanitation, and hygiene (WASH) was recognized in the report as a key sector for maximizing nutritional impact, but was not covered in depth as part of the self-contained guidance notes originally produced. Emerging evidence in the WASH sector suggests the linkages between WASH and nutrition may be stronger than previously understood. This has generated a great deal of momentum in both the WASH and nutrition sectors about how the two can work more closely to achieve better outcomes. This paper addresses this objective from both the WASH perspective, on how *nutrition-specific* programs (as well as *nutrition-sensitive* social protection, livelihoods, and community-driven development programs) can provide an alternative platform to deliver services at scale and more cost-effectively; and the nutrition perspective, on how WASH interventions can be adapted to include nutritional considerations, making them more *nutrition-sensitive*, and more impactful on nutrition.

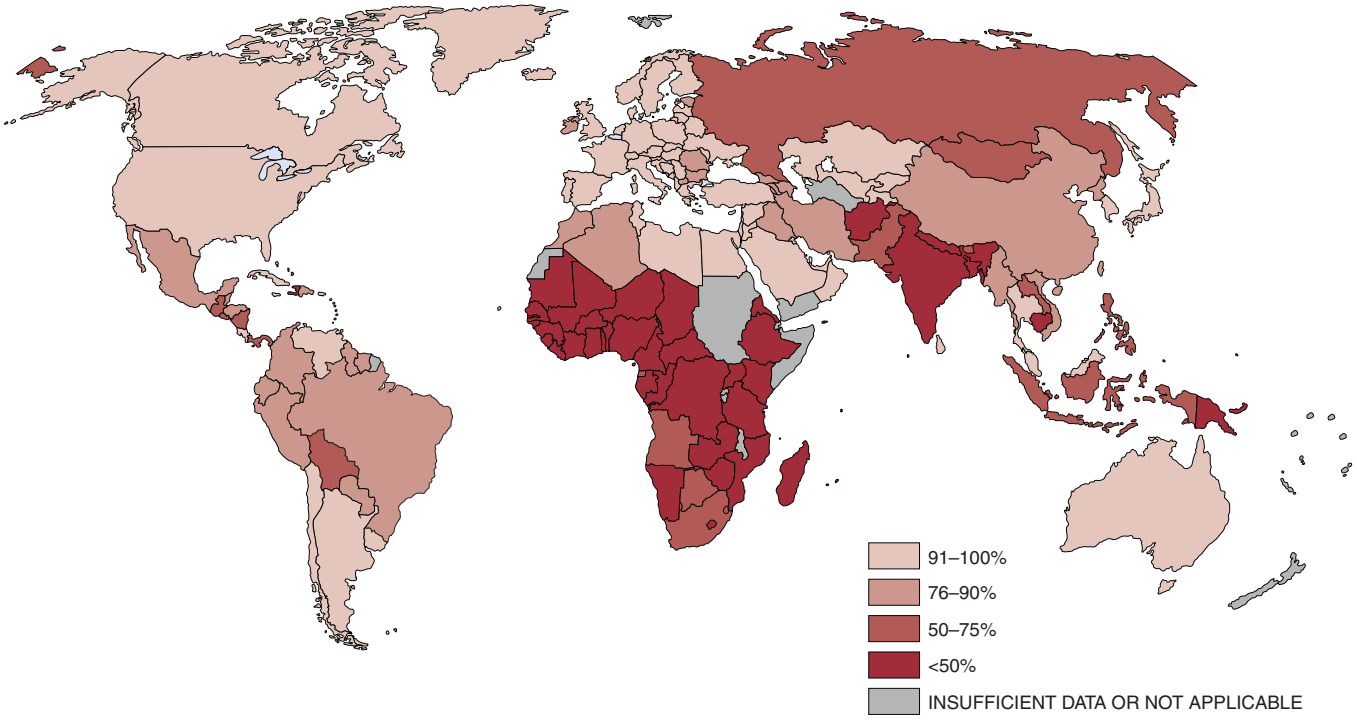
Child undernutrition and poor conditions of WASH coexist in many low- and middle-income countries. Sub-Saharan Africa and South Asia together account for the highest burden of child undernutrition (Black et al. 2013) and poor WASH globally as demonstrated in Figures 1–3.

FIGURE 1: GLOBAL PREVALENCE OF STUNTING AMONG CHILDREN UNDER AGE FIVE



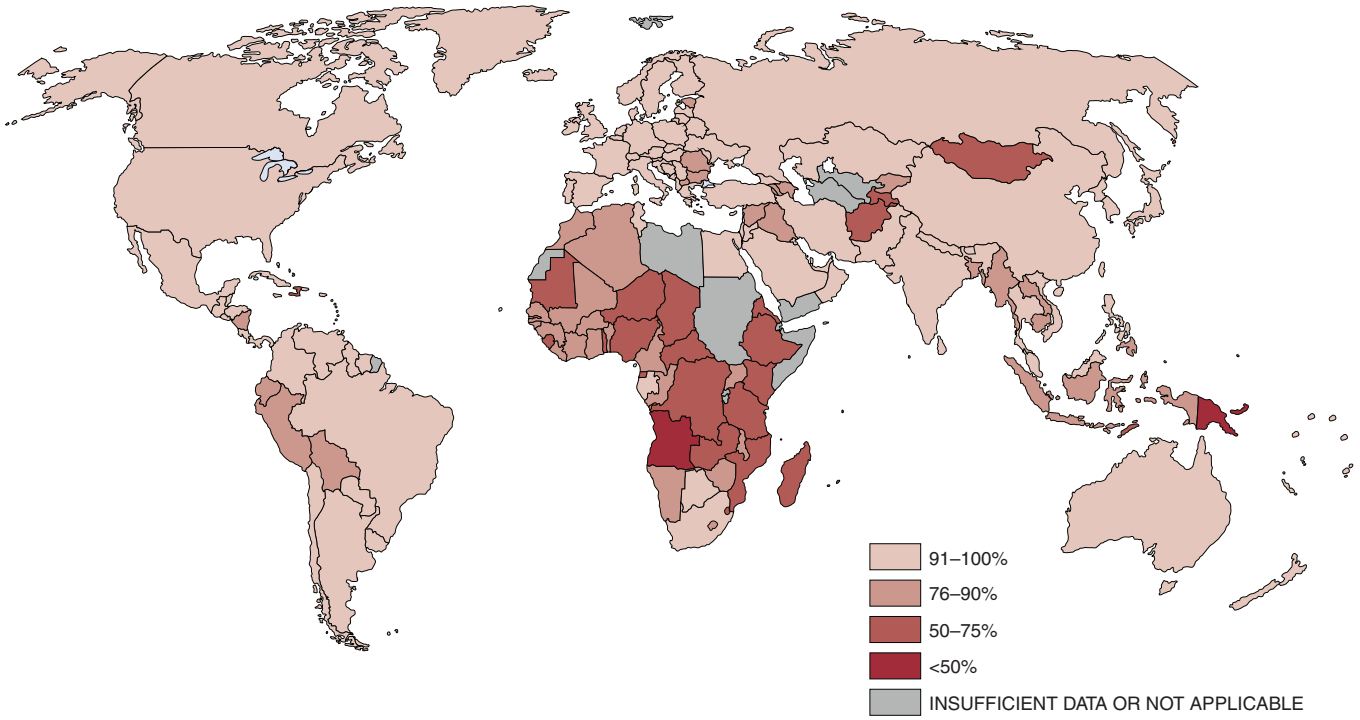
Source: Adapted from de Onis et al. 2013. Map reprinted with permission from the publishers, John Wiley & Sons, Inc.

FIGURE 2: GLOBAL PROPORTION OF POPULATION USING IMPROVED SANITATION



Source: Adapted from WHO and UNICEF 2015. Reprinted with permission from *Progress on Drinking Water and Sanitation: 2015 Update and MDG Assessment,* page 12. © 2015.

FIGURE 3: GLOBAL PROPORTION OF POPULATION USING IMPROVED DRINKING WATER SOURCES



Source: Adapted from WHO and UNICEF 2015. Reprinted with permission from *Progress on Drinking Water and Sanitation: 2015 Update and MDG Assessment,* page 6. © 2015.

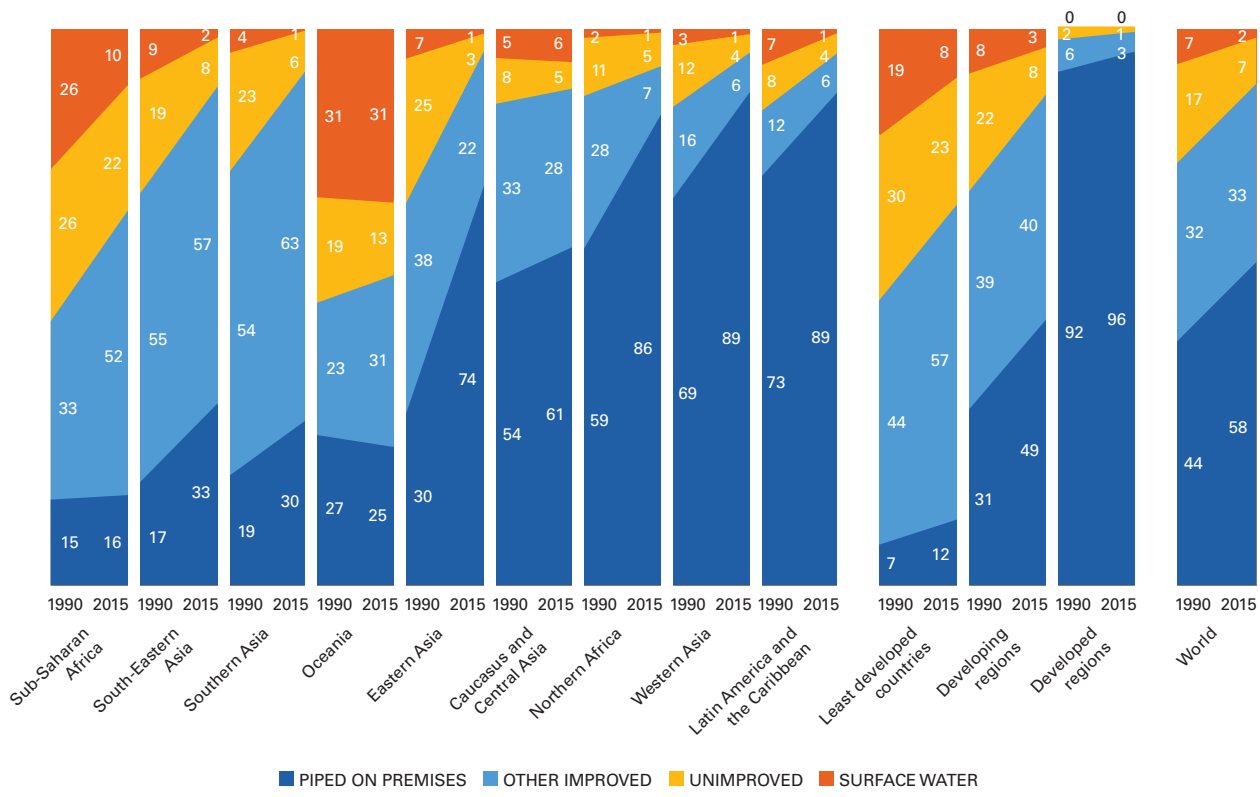
Ninety-one percent of the world's population had access to an improved drinking water source by 2015, surpassing the MDG target (WHO and UNICEF 2015). Despite this progress, an estimated 663 million people relied on unimproved water supply—half of these live in Sub-Saharan Africa and one-fifth live in South Asia (Figure 4).

Globally, an estimated 2.4 billion people did not have access to improved sanitation in 2015 (WHO and UNICEF 2015). Of these, 946 million still practiced open defecation. Two-thirds of those without sanitation live in South Asia (WHO and UNICEF 2015). Figure 5 shows trends in sanitation coverage between 1990 and 2015 by developing regions and the world.

This document outlines the rationale for nutrition-sensitive WASH, summarizes the scientific evidence on the pathways through which WASH impacts nutritional outcomes, discusses the challenges and opportunities for nutrition-sensitive WASH, and proposes a set of practical strategies and enhancements to existing project design that offer promising opportunities to impact nutritional outcomes. Despite well-known challenges to effective integration, an emerging interest in and attention to the role of WASH, and sanitation in particular, on nutritional outcomes provides a "window of opportunity" to influence policy and program design for greater impacts on nutrition.

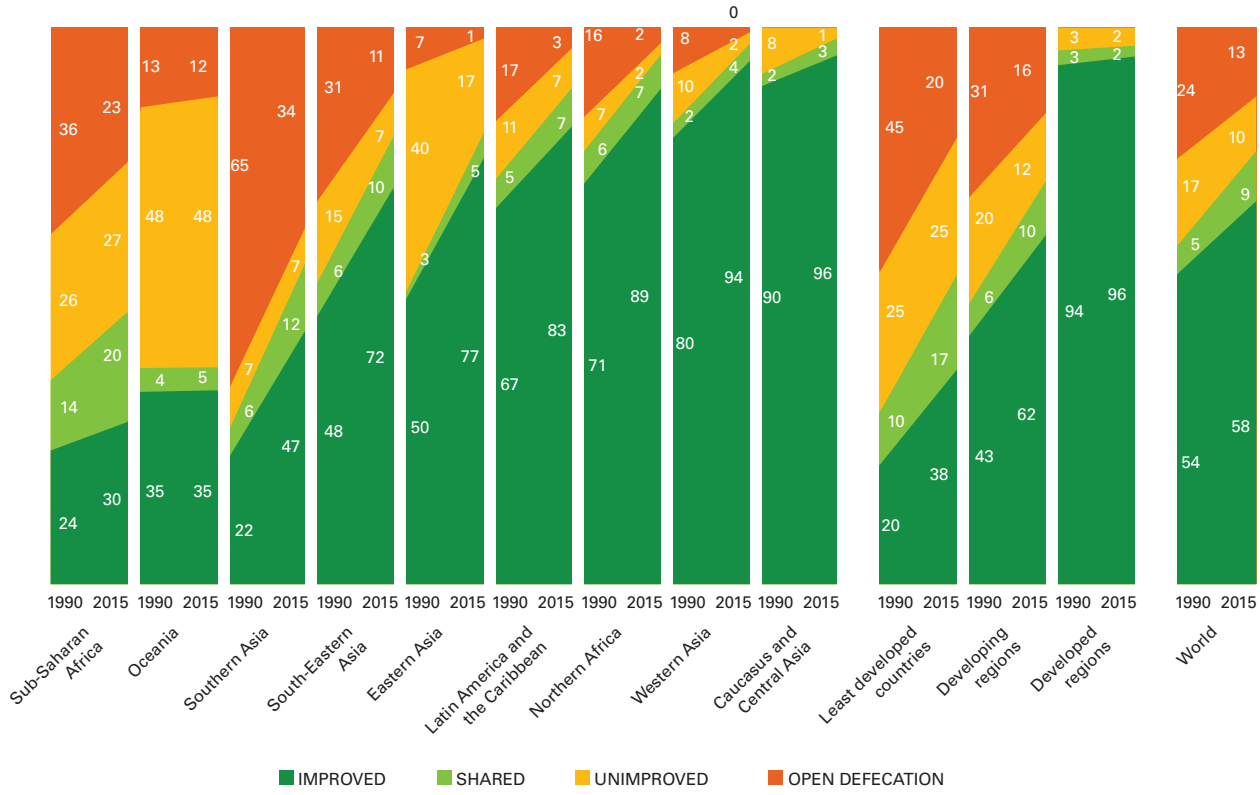
This paper explains why WASH is important for nutrition and vice versa, and draws on past experience with multisectoral approaches in the World Bank Group to outline practical steps for making the WASH sector more nutrition-sensitive, and ways that the nutrition sector can effectively integrate WASH interventions.

FIGURE 4: DRINKING WATER COVERAGE TRENDS BY DEVELOPING REGIONS AND THE WORLD, 1990–2015



Source: WHO and UNICEF 2015. Reprinted with permission from *Progress on Drinking Water and Sanitation: 2015 Update and MDG Assessment*, page 8. © 2015.

FIGURE 5: SANITATION COVERAGE TRENDS BY DEVELOPING REGIONS AND THE WORLD, 1990–2015



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II. Objective and Background

The objective of this paper is to support task teams and senior management to integrate WASH into *nutrition-specific* programs (as well as *nutrition-sensitive* social protection, livelihoods, and community-driven development programs), and to make WASH interventions more nutrition-sensitive, and thus more impactful on nutrition in the following ways:

1. Enhance the design of policy and lending operations in the WASH sector to maximize the impact on nutrition outcomes for the poor
2. Provide guidance on effective ways to integrate WASH with nutrition-specific and other nutrition-sensitive intervention
3. Measure the potential impact of activities on nutrition through meaningful outcome indicators, such as infrastructure quality, usage (behavior), and maintenance

The role of WASH, in particular, in improving nutritional outcomes has received greater attention in recent years. The attention has centered on a hypothesis that environmental enteropathy may be a key cause of chronic child undernutrition, and the primary pathway linking poor WASH to poor nutrition outcomes, rather than through diarrhea. A burgeoning body of evidence is finding strong linkages between poor sanitation, and open defecation in particular, and stunting. Finally, the strong association between income poverty, child stunting, and lack of access to water supply and sanitation highlights the critical need for interventions that will benefit this target group and increase prosperity among the bottom 40 percent.

Despite global momentum around this emerging evidence and high-level policy dialogue advocating for nutrition-sensitive WASH, practical guidelines on how to work cross-sectorally are currently lacking. This is particularly the case for WBG lending operations, which focus to a large extent on infrastructure investments, rather than the "softer" side of WASH, which includes behavioral change. To achieve greater impact, approaches to integration need to go beyond the traditional realms of handwashing with soap and safe drinking water and sanitation behaviors.

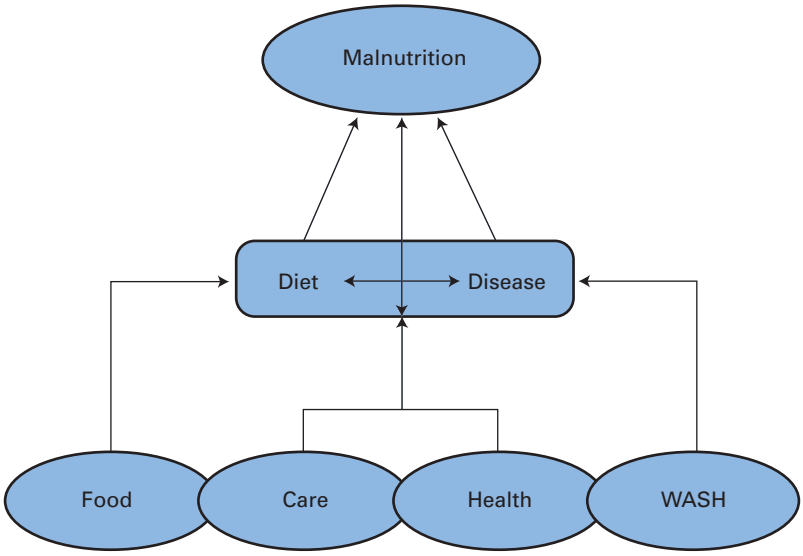
The solution is not as straightforward as including nutrition in project development objectives (PDOs), for which task teams would be held accountable. Instead, guidance is needed on how to incorporate nutritional considerations into WASH projects, while at the same time avoiding unnecessary complexities, to ensure that the contribution of WASH interventions to reducing undernutrition is accounted for.

Why Is WASH Important for Nutrition?

Undernutrition is both a major cause and an effect in the cycle of poverty triggered by inadequate WASH. Through the various theoretical pathways described below,

Woman and children washing hands, Indonesia. Photo: Ray Witlin / World Bank

FIGURE 6: DIRECT AND INDIRECT DETERMINANTS OF MALNUTRITION



Source: Adapted by the authors from UNICEF 1990.

poor WASH leads to infection and disease, resulting in undernutrition. In this weakened state, the body becomes more susceptible to infection and disease, creating a vicious cycle of poor health and, ultimately, development. The dual burden of poor WASH and undernutrition is common in areas with high rates of poverty, such as Sub-Saharan Africa and South Asia, which together account for the highest burden of child undernutrition (Black et al. 2013) and poor WASH globally.

The direct cause of undernutrition is inadequate dietary intake and disease (Black et al. 2008, UNICEF 1990). Underlying these immediate causes are household food insecurity, inadequate care and feeding practices, poor household environment, and inadequate health (Figure 6). Improved conditions of environmental health—good hygiene practices, safe water, and sanitation—influence undernutrition primarily by reducing infection and disease. Evidence also suggests that improved WASH access may influence nutrition outcomes by increasing the productivity of home gardens, leading to more nutritious food intake, and enabling more time and resources for caregiving by reducing time spent fetching water and caring for sick children and time and costs associated with seeking health treatment.

Why Is Nutrition Important for WASH?

Undernutrition is associated with poverty and is an indicator of nonincome poverty. One of the major pathways through which WASH can affect poverty is child nutrition. Children who get sick less often and who eat a better diet grow taller and stronger over time (Evans and Marcynyszyn 2004, Walker et al. 2007). Children who suffer from undernutrition during childhood fail to reach their human capital potential, which keeps not only them in poverty, but future generations of children as well (Engle et al. 2007, Victora et al. 2008).

The global development community has focused on eliminating income poverty, but evidence suggests that improving income does not guarantee improved nutrition outcomes unless explicit actions are taken to improve nutrition. In other words, poverty reduction goals cannot be met without addressing nutrition. Investments in WASH are one avenue to improving nutrition outcomes and therefore poverty.

III. Pathways Linking WASH and Nutrition and Available Evidence

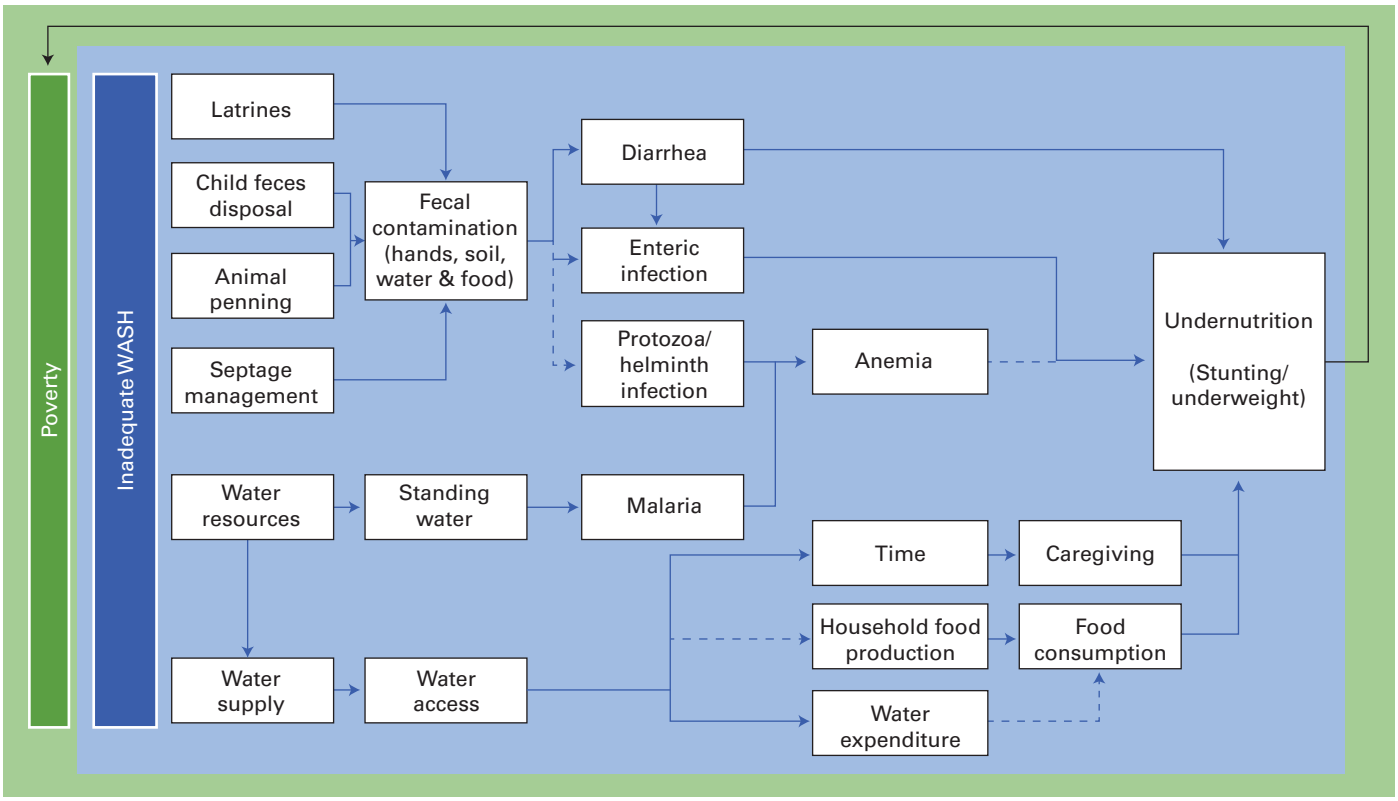
Inadequate WASH can impact child nutritional status through multiple pathways. These pathways and the strength of each, based on current evidence, are illustrated in Figure 7. This section describes the evidence supporting each pathway.

Pathway 1: Improved Nutrition through Reduction in Diarrheal Disease Due to Reduction in Fecal Contamination of the Environment

There is good evidence that fecal contamination of the household environment (Curtis et al. 2000, Marquis et al. 1990), soil contaminated with human and animal feces (Curtis et al. 2000, Pickering et al. 2012), and unsafe disposal of infant and child feces, all conditions found in areas of poor WASH, contribute significantly to the diarrheal disease burden (Mara et al. 2010). It is estimated that 58 percent of annual deaths caused by diarrhea are attributable to poor WASH conditions (Prüss-Üstun et al. 2014).

Water and sanitation interventions in turn are associated with lower risk of diarrhea and better nutrition outcomes (Esrey 1996, Checkley et al. 2004, Fink et al. 2011). Meta-analysis of intervention studies shows handwashing with soap reduces diarrhea by 40 percent (Freeman et al. 2014), improved sanitation reduces diarrhea by 28 percent, and improved water supply reduces diarrhea by 34 percent. However, there is wide variation in risk reduction for different service levels, with high-quality piped water reducing diarrhea by 79 percent but improved communal sources achieving only an 11 percent reduction. Similarly, sewerage connections can reduce diarrhea by 69 percent, whereas on-site sanitation only reduces the burden by 16 percent (Wolf et al. 2014). Within the category of on-site sanitation there is still little scientific

FIGURE 7: PATHWAYS LINKING WASH AND NUTRITION



evidence on the protective effect of different sanitation service levels. Sharing of facilities by more than one household has been shown to be associated with higher rates of diarrhea in a review of demographic and health surveys (DHS) from 51 countries; however, this analysis fails to account for other factors correlated with poor child health that might explain this association, such as poverty.

Although the relative contribution of diarrhea to undernutrition remains unclear, since poor nutrition itself is a cause of diarrhea, there is good evidence that repeated episodes of diarrhea in young children contribute to growth stunting (Checkley et al. 2008).

Pathway 2: Improved Nutrition through Reduction of Enteric Infections Due to Reduction of Fecal Contamination in the Environment

A recent hypothesis suggests that enteric infection (or environmental enteropathy) is the primary cause of child undernutrition, and the main route through which poor WASH causes stunting (Humphrey 2009).

Studies on children over the past two decades in the Gambia have demonstrated an association between enteric infection and stunting independent of diarrheal disease or poor diet (Campbell et al. 2003, Lunn et al. 1991). Enteric infection, and environmental enteropathy more specifically, is a subclinical condition of the small intestine, characterized by reduced nutrient absorption surface area, increased intestinal permeability, and subsequent systemic inflammation (Haghighi et al. 1997). Whether gastrointestinal mucosal damage was a cause or a consequence of undernutrition was not addressed by these studies, and despite having been studied for decades, the cause of environmental enteropathy is still not well understood.

The idea that environment rather than diet may be the major cause of growth stunting was originally postulated by Solomons et al. (1993). Yet research efforts to eliminate child undernutrition have largely focused on dietary solutions, such as complementary feeding, none of which have been able to eliminate stunting. A more recent hypothesis suggests that environmental enteropathy, caused by frequent exposure to and ingestion of fecal pathogens in places with poor hygiene and sanitation, is the main cause of child undernutrition (Humphrey 2009).

Household environments in low-income contexts are highly contaminated with fecal matter from poor-quality sanitation and open defecation practices. Freely roaming animals are common in such settings, especially where small-holder poultry farming is the norm (Marquis et al. 1990, Harvey et al. 2003, Ngure et al. 2013), contributing to high concentrations of animal feces in the environment. Both humans and animals tread on feces in the open, bringing pathogens into the domestic environment (Curtis et al. 2000) where infants and young children crawl, explore, play, and feed. Flies serve as another vector carrying pathogens from one place to another, especially onto food. Handwashing with soap is often not adequate in these settings (Curtis et al. 2000), so it does not prevent the spread and ingestion of fecal bacteria.

Recent research efforts have focused on testing the environmental enteropathy hypothesis and elucidating these causal pathways. Observational research has shown associations between household environmental cleanliness, such as access to water and sanitation infrastructure, biomarkers for environmental enteropathy, and standardized child height and weight scores (Lin et al. 2013). Yet, in other research, cleaning up the environment through improved handwashing behavior was not enough to reverse enteric infection and growth stunting, although it did reduce diarrheal morbidity (Langford et al. 2011).

Pathway 3: Improved Nutrition through Reduced Exposure and Infection with Protozoa and Helminths Due to Improved WASH

Protozoa and helminth infections are transmitted through soil (soil-transmitted helminthiasis, STH) and water (schistosomiasis) contaminated with feces. These infections are rarely fatal but cause poor appetite, nutritional deficiencies, and anemia, and exacerbate malnutrition (Stephenson 1987, Stephenson et al. 2000, Stoltzfus et al. 2004, O'Lorcain and Holland 2000). Studies have shown *Giardia* and helminth infections to be associated with

stunting (Crompton and Nesheim 2002, Simsek et al. 2004).

Where helminths are highly prevalent, deworming medication is administered as preventative chemotherapy through organized campaigns. This is a cheap and effective strategy to reduce infections, but cannot prevent future reinfection, especially in places with poor sanitation. Meta-analysis has shown improved sanitation to be effective in reducing the risk of soil-transmitted helminth infection (Ziegelbauer et al. 2012, Moraes et al. 2004, Barreto et al. 2010) and *Giardia* infection (Goto et al. 2009). Sanitation promotion is recommended as a complementary strategy to deworming and health education.

Pathway 4: Improved Nutrition through Reduction in Anemia Due to Improved WASH

Anemia is a blood disorder that most commonly results from insufficient dietary intake and absorption of iron. Iron can be absorbed through diet, but malnutrition can inhibit its absorption. Iron deficiency anemia is the most common nutritional deficiency in the world and highly prevalent in low- and middle-income countries. Blood loss and inflammation due to WASH-related infections, including malaria, acute respiratory infections, diarrhea, and hookworm infection (Stoltzfus et al. 1996) are a major cause of anemia (Weiss and Goodnough 2005). Without treatment, anemia can lead to chronic conditions

Students wash their hands before eating a prepared meal at the Hope Kindergarten Elementary School in Tarbarr Community in Buchanan City, Liberia, on June 25, 2015. Photo: Dominic Chavez / World Bank

that include poor fetal development, delayed cognitive development, higher risk of infection, fatigue, weakness, dizziness, and drowsiness. Dietary interventions that include iron supplementation have resolved fewer than half of the burden of childhood anemia globally (Stoltzfus et al. 2002).

Pathway 5: Improved Nutrition through Reduction in Time Spent Fetching Water and Caring for Sick Children, and Time and Costs of Seeking Treatment

Reducing the time that caregivers spend fetching water lowers diarrhea and improves nutritional outcomes in children under age five (Pickering and Davis 2012). The exact mechanism is not clear, although better access to water may enable improved hygiene practices (Motarjemi et al. 1993, Aiello et al. 2008) and make more time available for childcare (Miller and Urdinola 2010, Burger and Esrey 1995, Diaz et al. 1995, Cairncross and Cliff 1987) or income-generating activities (Koolwal and Van de Walle 2013). About 44 percent of the world's population must leave their homes to fetch water for drinking and other domestic uses (WHO and UNICEF 2010). The high costs associated with accessing improved WASH services and the time and cost of treating WASH-related illness can crowd out household income for other basic necessities such as nutrient-rich food.

In addition, households further away from a water source may face barriers to home gardening and other income-generating activities that have a direct or indirect effect on improving nutrition (Moriarty et al. 2003).

Pathway 6: Direct Links between WASH and Undernutrition

Several nonexperimental studies suggest that improved water and sanitation leads to increased linear growth (Esrey 1996, Checkley et al. 2004, Merchant et al. 2003, Fink et al. 2011) and observational research has demonstrated associations between access to in-yard piped water and child stunting. The effects are even more important for children of educated mothers (Mangyo 2008).

Evidence from observational studies also suggests improved water and sanitation have synergistic effects on weight-for-age Z-scores (WAZ) (Esrey et al. 1992, Esrey 1996).

Recent econometric analysis has demonstrated that cross-country differences in sanitation explained 54 percent of the variation in average height of children in Africa and Asia, suggesting that open defecation, which is exceptionally widespread in India, could account for much or all of the excess stunting in India (Spears 2013). Open defecation is especially harmful in areas of high population density, and is therefore a high risk factor for stunting in India. The number of people openly defecating per square kilometer linearly accounted for 65 percent of international variation in child height. Indian states with more open defecation per square kilometer had shorter children (Spears et al. 2013). Other recent econometric studies have likewise shown an association between poor sanitation and child stunting (Spears 2012, Hammer and Spears 2013).

Recent experimental evidence of the effect of sanitation on child nutrition comes from a Community-Led Total Sanitation (CLTS) intervention in Mali in which children were taller and less likely to be stunted in villages where CLTS had been implemented, leading to a reduction of open defecation. Improvements in weight and a reduction in the proportion of children underweight were also observed, but these results were not significant (Alzua et al. 2015).

Cross-country evidence from Lao PDR, Vietnam, and Tanzania show correlation between the ratio of households defecating in the open and those using unimproved sanitation in a community and height-for-age Z-scores (stunting) over time. As the proportion of households without sanitation increases, children grow shorter and stay shorter over time (Quattri and Rand 2014, Quattri et al. 2014a, 2014b).

Other pathways, such as improvements in child nutrition due to reductions in acute respiratory infection, malaria, and household food production have insufficient evidence to summarize here.

The first available evidence of a *direct* link (i.e., not through diarrhea) between improved WASH and child nutritional

outcomes comes from a recent systematic review and meta-analysis (Dangour et al. 2013) of five cluster randomized trials of WASH interventions (Du Preez et al. 2010, 2011; Luby et al. 2004, 2006; McGuigan et al. 2011). The meta-analysis found a borderline statistically significant effect of water and hygiene interventions on height-for-age Z-scores (HAZ) (mean difference 0.08; 95 percent CI 0.00 to 0.16) in children less than five years old. The same meta-analysis found no effect of WASH interventions on weight-for-age Z-scores (WAZ), in children under five, nor did three nonrandomized studies (Arnold et al. 2009, Bowen et al. 2012, Langford et al. 2011) included in the review. The reviewed studies were all short term (9–12 months duration), all had methodological limitations, and all were based on interventions that address only one or a few of the multiple pathways of fecal-oral transmission. The interventions showing an effect on HAZ included solar disinfection of water, provision of soap, and improvement of water quality. Experimental evidence on water supply improvement and sanitation was insufficient to include in the meta-analysis.

Because of strong biological plausibility of this link, isolating the effect of WASH interventions on nutrition outcomes is receiving increased attention in the research community. Two field-based studies, WASH Benefits (Arnold et al. 2013) in Kenya and Bangladesh and the Sanitation Hygiene Infant Nutrition Efficacy Project (SHINE, http://clinicaltrials.gov/show/NCT01824940) in Zimbabwe, aim to shore up some of the evidence gaps on the direct nutritional impacts of integrated interventions through well-designed, randomized controlled trials that address multiple pathways of fecal contamination.

The SHINE study in rural Zimbabwe will evaluate the effect of (i) WASH alone (latrines, water treatment, safe feces disposal, handwashing with soap, hygienic food preparation, and protected play areas for infants; and (ii) WASH plus infant and young child feeding against a comparison group receiving standard health and nutrition preventive care (breastfeeding promotion, prevention of transmission of HIV/AIDS from mother to child, and village health worker visits) on environmental enteropathy, child stunting, and anemia. The interventions are initiated during early pregnancy and continue through 18 months postpartum to capture the initial 1,000 days of a child's life.

In Kenya and Bangladesh the WASH Benefits studies will assess the individual impacts of improved water quality, sanitation, handwashing, and nutritional supplements, as well as combinations of these interventions, on linear growth and diarrhea in children under five.

In addition to these clinical studies, impact evaluations initiated in the WASH sector in recent years are designed to measure nutrition impacts such as enteric dysfunction and child growth.

IV. World Bank Group's Water Program

Although WASH interventions supported by World Bank Group projects may contribute to improved health and nutrition outcomes, nutritional outcomes are perceived as too far down the causal chain to be adopted as project development objectives.

The 1993 Water Resources Management Strategy was the first in the World Bank Group to recognize the health benefits of water supply and sanitation (World Bank 1993). In 2004, the Water Supply and Sanitation Sector Board developed a sector program to guide WBG lending and nonlending technical assistance, which recognized improving health outcomes as one of five cross-cutting operational, policy, and institutional priorities requiring investment in WASH infrastructure as well as behavioral change and a focus on the poor as an institutional priority (World Bank 2004). The program adopted a three-pronged strategy to realize health benefits of improved WASH: (i) access to sufficient quantities of water, (ii) sanitary disposal of excreta, and (iii) sound hygiene practices.

Over the past decade, a handful of water supply, sanitation, and hygiene projects supported by the World Bank Group have explicitly targeted nutrition. A portfolio review conducted for this paper examined whether and how WBG water supply, sanitation, and hygiene projects incorporate health and nutrition objectives, activities, and outcomes. The review included all water supply (WC), sanitation (WA), and general water and sanitation (WZ) approved projects from fiscal year 2005 through 2014 (n = 274) with health (JA) and/or social services (JB) sector coding. A total of 14 projects meeting these criteria were reviewed.

Of the reviewed projects, five referenced health and/or nutrition objectives in the project development objective (PDO)[2] and only one project included nutrition-specific activities.[3] In terms of measured outcomes, one project measured a nutrition-specific outcome and three measured health outcomes such as diarrhea incidence and incidence of water and excreta-related disease transmission.

This new latrine was built by a local sanitation entrepreneur in Bangladesh, who was supported by WSP using sanitation marketing. Photo: Mirva Tuulia Moilanen / World Bank

The majority of the projects with cross-sector coding and considered by the review as "multisectoral" were identified as such because they included hygiene education and/or hygiene behavior change interventions (12 projects/86 percent), specifically handwashing with soap, which is classified as a nutrition intervention by the nutrition sector. Only four of these projects included a government health agency among the project's partners.

[2] Keywords included quality of life, health-specific terms, livelihood, human development, improved health-related behaviors, hygiene living conditions, nutrition-specific terms, basic services, and poverty reduction.

[3] Nutrition-specific activities were defined to include infant and young child feeding practices, prenatal/maternal nutrition, micronutrient supplementation, child growth monitoring, and nutrition and food hygiene education interventions, as well as nutrition components of early childhood development programs, nutrition components of social safety nets, home gardens and small livestock production, and targeted emergency food aid.

V. World Bank Group's Nutrition Program

In 2008, *The Lancet* series on Maternal and Child Undernutrition identified a set of priority interventions with robust evidence of effectiveness and cost-effectiveness (Lancet 2008). The Nutrition Global Solutions Group in the World Bank Group is aligned with these guidelines in its lending and nonlending technical assistance programs. Although nutrition investments are a small proportion of overall WBG lending, they are often not formally coded as nutrition activities, making them even more difficult to quantify. The World Bank Group now uses a dual reporting system for nutrition projects and components of projects, which includes Theme Code 68 for Nutrition & Food Security as well as Development Assistance Committee (DAC) codes:

- Promoting adequate infant and young child growth
- Improving breastfeeding practices
- Ensuring the adequate and timely introduction of complementary foods
- Implementing programs to reduce micronutrient malnutrition such as fortification, supplementation or food-based strategies, and disease and parasite prevention and control (e.g., helminths, tuberculosis, malaria, HIV/AIDS)
- Improving adolescent and maternal nutrition and reducing low birth weight
- Developing capacity in nutrition planning and policy development, including consumption effects of food policy
- Improving institutional development and capacity to design, implement, and monitor nutrition interventions
- Developing and integrating nutrition education and behavior change communication (BCC) into nutrition interventions
- Targeting food supplementation to malnourished women and children
- Using food-based safety nets, including food stamps, food subsidies, and food for work, with nutrition objectives
- Including nutrition components in early childhood development, school health, reproductive health, and other programs
- Ensuring that food security interventions, including income generation, labor-saving technologies, improved marketing systems, and food distribution networks, have explicit objectives to improve household food security, food intake, and/or nutrition outcomes
- Increasing crop/livestock production to benefit the most malnourished and food insecure
- Targeting emergency food aid to the most vulnerable, including famine relief programs
- Developing and implementing nutrition monitoring and surveillance to improve nutrition interventions and affect policy change
- Developing policies and programs concerning diet-related noncommunicable disease prevention and control

VI. Challenges to Multisectoral Approaches in the WASH Sector

The challenges of working multisectorally are well recognized and are not unique to the WASH sector. Lack of incentives, institutional barriers, weak client demand and donor funding, risk aversion, and insufficient knowledge of best practices are all limiting factors. The following are some of the key challenges and how they specifically influence multisectoral approaches in the WASH sector.

Lack of evidence to enable prioritization of WASH interventions. There is still limited knowledge as to which WASH interventions and in what combinations are most effective for reducing fecal contamination of the environment. In order to integrate WASH components beyond handwashing with soap, the nutrition sector needs evidence on where to focus its efforts. Similarly, the research community is still building the evidence base on which WASH interventions are most strongly linked with nutrition.

Some key WASH interventions hypothesized to impact nutrition, such as basic sanitation and improved water supply, have not been subject to the level of rigorous study needed to generate evidence that could be used to advocate for nutrition-sensitive approaches. This level of evidence is generally available through the gold standard in scientific research, randomized controlled trials. However, in a recent Cochrane review of the impact of WASH interventions on nutrition outcomes, neither sanitation nor water supply improvements were included due to lack of experimental evidence on the effects.

Similarly, there is limited evidence of the costs and cost-effectiveness of nutrition-sensitive WASH interventions compared with a business as usual approach. There could be a strong economic argument for integration if targeting of WASH investments brings greater returns, as measured by health and nutrition outcomes. Similarly, leveraging delivery channels could lead to cost savings, resulting in more cost-effective programs.

There is increasing attention in the research community to study and isolate the effects of WASH on nutrition, but until this evidence is available, projects face risks proposing approaches that are not backed by strong evidence.

Inherent complexity of WASH projects. Water projects have one of the lowest disbursement rates of the infrastructure global practices. A high number of "problem projects" (that is, projects facing procurement delays, slow disbursement, and financial management issues) is indicative of the technical complexity of water projects. Project TTLs trying to meet tight deadlines for project preparation and who are accountable for delivery of the portfolio are understandably reluctant to introduce project components that may get derailed during project appraisal.

Institutional complexity is likewise a challenge. Water and sanitation are often handled by different line ministries in client countries, which can add further complexity to already demanding timeframes and technically challenging projects. At the same time, in some countries, sanitation and hygiene are under the authority of Ministry of Health, which opens avenues for closer integration between WASH and nutrition-specific projects.

Focus on infrastructure lending. The vast majority of World Bank Group loans in the WASH sector target large infrastructure: sewerage networks, wastewater treatment plants, and water supply systems. Infrastructure lending results in large loans with easily quantifiable outcomes. On-site sanitation and fecal sludge removal are seldom financed. On the other hand, there is little lending for the "softer" side of WASH, specifically communication, education, and behavior change, which are required in order for WASH interventions to have an impact on health and nutrition.

VII. Opportunities for Nutrition-Sensitive WASH

Despite these challenges, an emerging interest in and attention to the role of WASH, and sanitation in particular, on nutritional outcomes has provided a "window of opportunity" to influence how the World Bank Group approaches lending for WASH projects, and how policies are designed for greater impact on nutrition. Some reasons for this are:

Environmental enteropathy hypothesis. Attention has recently focused on the role of environmental enteropathy (or enteric infection more broadly) on poor child nutritional outcomes. Research has only just begun to try to understand the contribution that poor WASH has on environmental enteropathy, which could prove to be a major link between WASH and child nutrition.

Sustainable Development Goals. With the recognition that progress on the sanitation MDG was not as fast as that on water supply, sanitation is being prioritized in the post-2015 development dialogue. The emphasis of the expected SDGs on eliminating open defecation shifts the focus from infrastructure to behavior change, conferring more plausible nutritional benefits of WASH. The SDGs will again call attention to the nonincome face of poverty with a nutrition indicator on stunting. Investments in improved WASH can contribute to reducing both income and nonincome poverty.

WBG reform and the twin goals. Eliminating extreme poverty and increasing shared prosperity will require eliminating nutritional deficiencies, which demands input from multiple sectors. The twin goals motivate a shift in thinking toward the bottom 40 percent, who are most likely to lack access to WASH services and be undernourished. Targeting will become more important as the WBG works toward reducing extreme poverty and increasing shared prosperity. Secondly, the new Global Practice structure, in particular the positions of program leader and global solutions group lead, could prove to be a unique facility to (i) identify cross-sectoral solutions and (ii) provide an enabling environment for multiple sectors to work toward the same goal.

A child drinks clean, safe water in rural Badakhshan province, Afghanistan. Photo: Imal Hashemi / Taimani Films / World Bank

VIII. Principles for Nutrition-Sensitive WASH Investments and Policies

WASH investments and policies that incorporate nutrition-sensitive goals explicitly into design and implementation can increase nutritional impact. Although access to WASH services has been the primary focus of the WASH sector in the MDG era, issues around equity, usage, and maintenance of services are becoming increasingly important. An emerging toolkit of evidence-based guidance, instruments, and incentives provides tremendous opportunity to capitalize on the unique synergies between WASH and nutrition to increase the development effectiveness and nutritional impact of WASH investments. The following are four key principles for action:

1. Improve geographic and demographic targeting to reach populations where water and sanitation coverage is low and undernutrition is high
2. Utilize best practices in behavior change and insights from behavioral economics to maximize the impact of WBG operations on nutrition
3. Leverage the program-for-results lending instrument and other institutional incentives to align WASH and nutrition objectives
4. Incorporate nutrition-sensitive objectives and indicators into WASH investments and WASH policies.

Based on these four key principles for action, the following are proposed strategies and enhancements to existing project design, monitoring, and evaluation of WASH interventions that offer promising opportunities to increase the nutritional impact of WASH investments.

1. Improve Geographic and Demographic Targeting to Reach Populations Where Water and Sanitation Coverage Is Low and Undernutrition Is High

Current Status

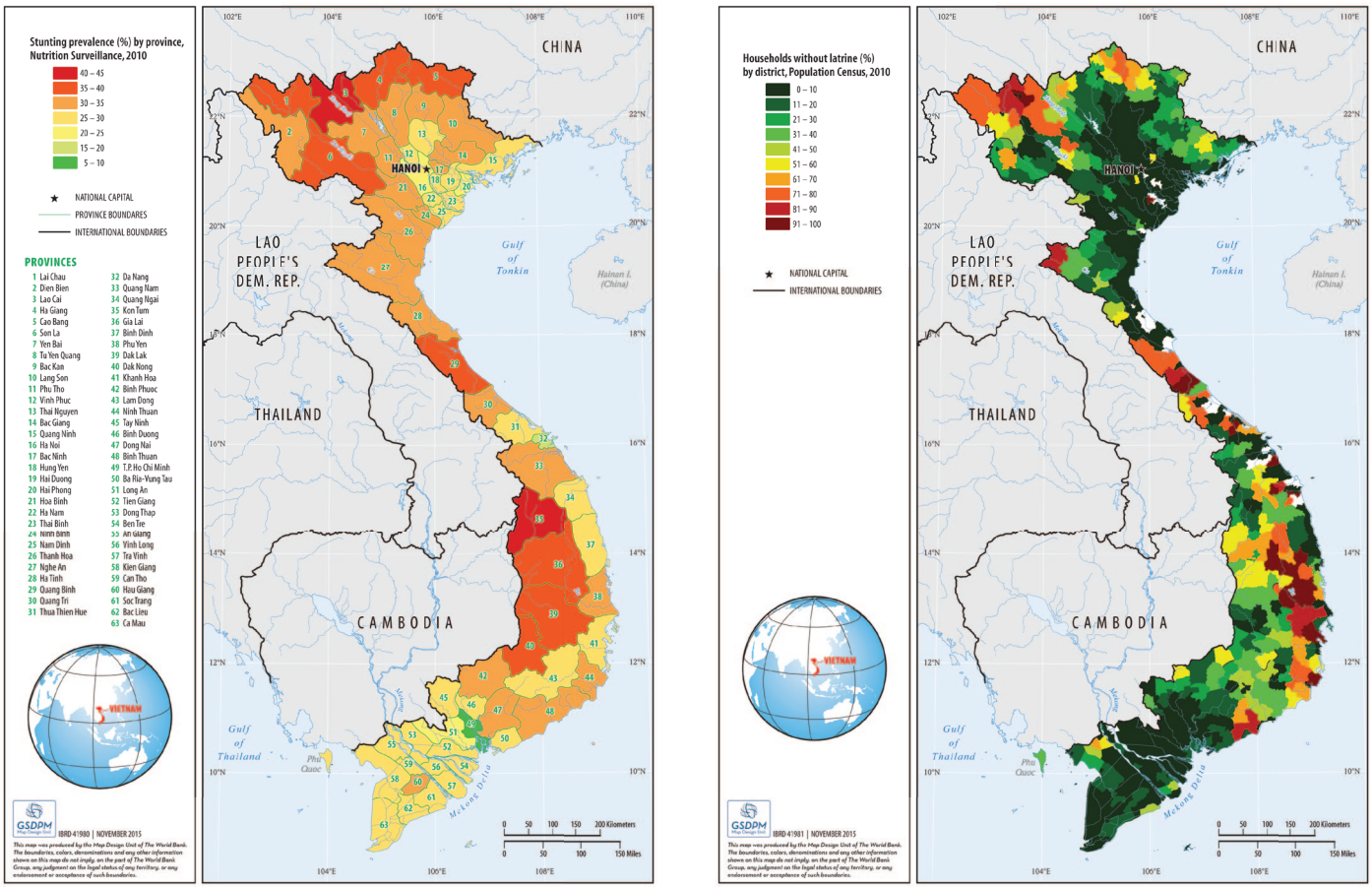
Distributional analysis shows that the poor are most likely to lack access to WASH, and evidence shows that pro-poor targeting of sanitation, such as in urban slums, has greater potential for improving health outcomes because of higher disease burden and increased susceptibility combined with lower access levels (Rheingans et al. 2012). WASH, Health, and Nutrition projects conducted between fiscal years 2005 and 2014 were most frequently undertaken in low-income countries with the dual burden of undernutrition and poor access to WASH, indicating appropriate targeting is happening at a macro level. Eighty percent of these projects indicate a target beneficiary group such as the poor and women and children. However, project documents seldom contain information on how target beneficiaries are identified, increasing the likelihood that target groups may not effectively be reached.

Taking It Further

Data visualization tools such as mapping can improve targeting by identifying the coexistence of nutritionally vulnerable populations and poor WASH access. A recent initiative undertaken jointly between the Water and Sanitation Program and the Poverty Practice compiled population census data on access to sanitation in Vietnam and presented this side-by-side with rates of child stunting to highlight areas of the country where these burdens coexist. The resulting maps (Figure 8) informed the design of a Program-for-Results (PforR) operation on Scaling Up Rural Water Supply and Sanitation in the Northern Mountain and Central Highland regions. Visual tools such as mapping can be extremely effective in dialogue with client countries, but are not yet widely available in the WASH sector.

Operations can leverage large poverty reduction platforms, including conditional cash transfer (CCT), community-driven development (CDD), and rural livelihoods, to mainstream WASH and reach the poor who lack access. CDD programs finance a range of nutrition-sensitive interventions, including water supply, sanitation, health, and agriculture. Although nutrition-specific interventions are seldom components of CDD programs, the menu of options for communities may include other nutrition-sensitive interventions, such as agriculture, and developing demand for nutrition interventions is an important part of these programs. Moreover, CDD programs can serve as a cost-effective platform for delivering nutrition-related services and evidence shows these programs to have an impact on underweight, stunting (Arcand and Bassole 2007), and

FIGURE 8: STUNTING RATES AND OPEN DEFECATION IN VIETNAM



malnutrition (Olken et al. 2011). When poverty maps have been used, these programs have been particularly effective in selecting poor areas in which to operate (Wong 2012).

CCT programs incentivize preventive health and nutrition actions such as prenatal visits for pregnant women, well child visits, growth monitoring, immunization, and family development sessions/life-skills training, which often focus on changing nutrition-related behaviors of families. CCT programs can be a cost-effective platform to reach target audiences as the targeting systems used by these programs enable both geographic and demographic (first 1,000 days) targeting without incurring additional costs.

The Water practice through the Water and Sanitation Program (WSP), in collaboration with other practices, is currently providing technical assistance to several client countries, including the Philippines, Lao PDR, Vietnam, and India to mainstream rural sanitation into poverty-reduction projects. In the Philippines, for example, sanitation demand generation, behavior change communication, and access to financial products intended to remove financial barriers to purchasing a toilet will be integrated into the *Pantawid Pamilya* CCT and outcomes evaluated through a randomized controlled trial impact evaluation. Importantly, these approaches to integration do not try to make WASH outcomes a conditionality of these programs, but rather leverage the large-scale platform that the CCT program provides to reach target audiences.

2. Utilize Best Practices in Behavior Change and Insights from Behavioral Economics to Maximize the Impact of World Bank Group Operations on Nutrition

Current Status

WASH infrastructure, such as household latrines, water supply systems, and handwashing facilities, is necessary but not sufficient for meeting nutrition objectives. Two recent rigorous evaluations of India's flagship rural sanitation program have attributed lack of evidence for health impacts to lack of use of newly constructed toilets (Patil et al. 2014, Clasen et al. 2014). Similar findings have been documented for clean water supply, where transport, storage (Brick et al. 2004, Shaheed et al. 2014), and poor hand hygiene (Pickering et al. 2010) reintroduce disease-causing pathogens, and for handwashing facilities, which are a poor predictor of actual handwashing rates (Ram et al. 2014). Without adequate and consistently practiced WASH behaviors, such as handwashing with soap, water treatment and safe handling practices, and use of latrines, infrastructure inputs alone will not lead to health and nutrition outcomes. Behavioral change has not been sufficiently prioritized in World Bank Group WASH lending operations in the past. Behavior change elements of lending projects are dwarfed by larger infrastructure investments. At the same time, there is limited capacity both within the WBG and in client countries to conduct state-of-the-art behavior change campaigns and approaches.

Taking It Further

Although still not a science, evidence is emerging about how to scale up effective behavior change for water, sanitation, and hygiene. In the hierarchy of behaviors, using a toilet and handwashing with soap seem to matter most for stopping the spread of pathogens. Treating water to remove fecal pathogens before drinking it and using clean water for cooking are also important, especially as there is no guarantee that these other behaviors have been practiced consistently. However, experience shows that just teaching people about these behaviors is not enough since knowledge is already high in many contexts. We also know that telling people about the health benefits of these behaviors is not the most effective way to improve practices—people respond more strongly to emotional appeals such as a desire to be clean and modern. Thus communication campaigns are designed to appeal to a person's dignity, pride, or a desire to nurture one's children. A new genre of interventions has emerged using innovative information and marketing campaigns to advocate for better individual hygiene behaviors and practices.

To date, behavioral economics has not been fully exploited by the water and sanitation sector. However, it is increasingly recognized that insights into how humans make decisions and the behavioral biases that dictate much of this decision making can play a large role in how likely people are to take up interventions (Coville and Orozco 2014). For instance, people dislike losses more than gains (loss aversion), so messages that highlight costs and losses are likely to be more effective (Kahneman and Tversky 1979). In other words, it may be more effective to tell people they will be sicker and poorer if they do not wash their hands. This is counter to the predominant messaging in the sector, which emphasizes the health benefits of improved water and sanitation.

A new concept, termed "baby-wash," is also drawing interest from sector practitioners. It refers to WASH interventions that address child-specific or child-related behaviors and risk factors, such as frequent mouthing of fingers and objects during exploratory play, and playing in areas contaminated with human and animal feces from poor waste disposal practices. Traditional WASH infrastructure investments have largely bypassed some of these dominant fecal contamination pathways that affect small children.

Technical assistance to clients in both the Water and Nutrition sectors can help bring these best practices into project design and implementation and help to achieve behavioral compliance—itself a precondition for nutrition outcomes. Likewise, closer coordination between WASH, nutrition, and agriculture colleagues can help address a major source of disease-causing pathogens in some contexts.

3. Leverage the Program-for-Results Lending Instrument and Other Institutional Incentives to Align WASH and Nutrition Objectives

Current Status

Lack of incentives at both the project and institutional levels has limited multisectoral collaboration. Institutional barriers exist in the World Bank Group in the form of staff time allocation, sector-specific budgets, and project coding systems that effectively disallow ownership of projects by multiple sectors. Integration is viewed as cumbersome to manage and risky to achievement of project objectives, despite demonstrating similar performance in practice (IEG 2009).

Institutional resources exist for supporting cross-sectoral work, but may not be fully utilized. For instance, the Health Results Innovation Trust Fund (HRITF) has set aside $100 million in grants for sectors outside health that incorporate a results-based financing mechanism linked to health outputs and outcomes, but use of these funds for nonhealth sectors has been limited.

Incentives operate at the project level as well. Results-based approaches[4] are increasingly mainstreamed for achieving desirable outcomes in development, and could be an effective instrument to incentivize WASH projects to incorporate nutrition-sensitive objectives. Experience to date using results-based approaches in water and sanitation is limited. A review undertaken by the WBG indicated that less than 5 percent of its output-based aid (OBA) portfolio was in water and sanitation (Mumssen et al. 2010). The use of OBA in water and sanitation has since increased under the Global Partnership for Output-Based Aid (GPOBA), which currently lists 22 projects in water supply and sanitation.

The WBG's new PforR lending instrument currently has three active operations in Water Supply, Sanitation, and Hygiene (India, Mexico, and Vietnam) with three more under preparation in Sanitation (Egypt, India, and Vietnam).

In the past, outputs for results-based WASH projects have been limited to water, sewerage, or sanitation connections. Associating disbursement linked indicators (DLIs) with behavioral, health, or nutrition intermediate outcomes could incentivize projects to improve targeting and implementation, with resulting impacts on health and nutrition.

Taking It Further

Institutional levers can be used to align incentives of TTLs and managers with multisectoral approaches. Recent reforms and restructuring that aim to institutionalize and incentivize cross-sectoral solutions to development challenges present a unique opportunity. Most notably, movement toward the twin poverty alleviation goals aiming for reduced extreme poverty and increased shared prosperity motivate a shift in thinking toward the bottom 40 percent. Targeting will become more important as the World Bank Group works toward these twin goals, and can help bring actors together to develop multisectoral solutions that can best meet the needs of this population. Secondly, the new Global Practice structure can be a unique facility to (i) identify cross-sectoral solutions and (ii) provide a supportive environment for multiple sectors to work toward the same goal. *Country directors* and *practice leads* can be crucial leverage points early in a project because of their frequent role as chair of concept note reviews, which places them in a position to ask critical questions, and their mandate to collaborate across sectors. *Practice managers* play a role in influencing TTLs (and other PMs) through email and other communications. *Peer-to-peer* engagement across sectors is also important, where TTLs working alongside each other in the same country, even on projects for different sectors, can come together to discuss respective projects and collaborate on a shared framework. Within this context, earmarking of resources for cross-sectoral operations could spur further innovative ideas and approaches.

Despite reforms underway in the WBG and the opportunity that this presents, incentives will not necessarily change at the country level. Therefore, multisectoral approaches will continue to benefit from engagement of champions at the

[4] Examples include output-based aid (OBA), results-based financing (RBF), cash on delivery (COD), pay for performance (P4P), performance-based financing/contracting, and conditional cash transfers (CCT).

country or regional level who understand both sectors and can help identify opportunities and advocate for nutrition-sensitive approaches. Champions can help bring together the appropriate knowledge and expertise to ensure that nutrition-sensitive WASH interventions apply the most up-to-date methods and materials. Similarly, champions that span both sectors can help bring knowledge and innovation from one sector to the other.

Incentives need to change at the project level as well to mainstream nutrition-sensitive WASH. Two recent large-scale operations under development will finance activities that address the behavioral constraints to wider take-up of WASH interventions and pioneer behavioral change as a main project outcome. The Sawatch Bharat Mission (SBM) in India and the Scaling Up Rural Water Supply and Sanitation Program (SUpRWSS) in Vietnam include reduction in open defecation and increased use of improved sanitation as key result areas for disbursement under the PforR instrument. Both projects thus recognize that infrastructure provision alone is not sufficient to achieve development results. Although neither project intends to measure health or nutrition outcomes, documented behavior change can provide evidence of plausible impact. Furthermore, both projects will collaborate with institutional partners in the health and nutrition sectors, which demonstrates the priority placed on nutritional impact for these projects.

4. Incorporate Nutrition-Sensitive Objectives and Indicators into WASH Investments and Policies

Current Status

Although health is often cited as a potential benefit of WASH interventions, it is seldom included as an explicit objective, decreasing the likelihood that health outcomes are realized. For instance, a report commissioned by the Independent Evaluation Group (IEG) states that although half of the water supply and sanitation projects reviewed between fiscal years 1997 and 2006 claimed to have health benefits, only one in 10 included this as an objective, and just 3 percent had improving health among the poor as an objective. Moreover, the number of projects that include health objectives has been steadily declining. Between fiscal years 2002 and 2006, just one in 20 water supply and sanitation projects had an objective to improve health (IEG 2009). These findings were echoed, albeit more starkly, in the portfolio review undertaken for this paper, which found just four projects (1 percent) out of a total of 274 reviewed between fiscal years 2005 and 2014 with a project development objective related to health or nutrition. This further decline could be a reflection of an increasingly lower priority that meeting health and nutrition objectives has in the WASH sector. On the other hand, it could be an outcome of the increased scrutiny on the formulation of project development objectives, which leads to a reluctance by project TTLs to include higher-level development objectives.

Taking It Further

What we know from multisectoral approaches in other sectors is that it is critical for WASH interventions that intend to improve nutrition outcomes to include nutrition as an objective or indicator, and vice versa. Whereas WASH projects are required to report progress on core sector indicators at the output level (e.g., people provided with access to improved sanitation facilities, number of piped water connections, people trained to improve hygiene or sanitation practices, etc.) progress for nutrition-sensitive WASH needs to be measured at the outcome, and in some cases impact, levels. Following is a list of potential indicators at the outcome and impact levels that are recommended for use by projects that incorporate nutrition objectives. All projects that intend to improve health and nutrition outcomes should include at a minimum a checklist of behavioral proxies that are relevant for the project. Projects that intend to evaluate effectiveness or impact should go a step further to include indicators at the impact level.

Outcome Indicators

Self-reported behavior and behavioral proxies such as infrastructure and environmental spot-checks are more strongly associated with improved health and nutrition outcomes than access to infrastructure alone, but do not require costly health measurement.

- **Usage**: Access to infrastructure should not be confused with actual usage, which is a measure of behavior. Measures of usage include:
  - Observation of a well-trodden path to the latrine
  - Observation of a water seal (for wet latrines)

- Observation of cover in place (for dry pit latrines)
- Transect walks in community to identify open defecation
- Presence of fecal matter (including child feces) in the housing compound
- Presence of residual chlorine in water
- Availability of soap and water at a designated place for handwashing

- **Maintenance**: Maintenance of infrastructure, and cleanliness in particular can indicate use. Measures include:
  - Observation of feces around pit
  - Cleanliness of toilet
  - Presence of flies
- **Behavior**: Measuring behavior is challenging since beneficiaries may overreport desirable behaviors (called "social desirability bias") and are more likely to alter their behavior while under observation. Although these measures should not be used to measure *levels* of impact due to the likelihood that they overestimate actual behavior, they can serve as indicators of the *direction* of impact. Behavioral outcome measures include:
  - Self-reported behaviors (handwashing with soap) at critical moments (after defecation, before preparing food), open defecation, child feces disposal, safe water storage, and treatment of drinking water
  - Observation of behaviors (handwashing with soap) at critical moments (after defecation, before preparing food), child feces disposal, safe water storage, and treatment of drinking water

Environmental Impact Measures

- **Environmental fecal contamination**: Presence of fecal indicator bacteria and *E. coli* in water, soil, and on hands and food is highly correlated with subsequent health outcomes. Measuring reduction in fecal contamination could provide evidence that an intervention is having an effect.
- **Fly density**: Presence and quantification of flies using fly grills or fly tape can demonstrate improvements in cleanliness. Since flies are a major vector for the spread of disease, a decrease in fly density may indicate lower disease risk.

Health Impact Measures

- **Diarrhea**: Evidence of diarrhea prevalence is relatively easy to collect, but it is highly variable and requires large sample sizes to estimate with precision. Self- or caregiver-reported diarrhea can be biased downward due to placebo effects, social desirability bias, and recall attenuation bias, and therefore may show impact where there is none. Moreover, diarrhea is caused by multiple factors, and without an appropriate research design to attribute causality, data may not be sufficiently specific to demonstrate impact. Measures of diarrhea include:
  - Incidence of diarrhea in previous seven days (or two weeks) for children under five and/or for adults
  - Symptom-based recall of watery stools and three or more stools per day, or blood in stool
- **Anthropometrics**: Child anthropometrics are objective measures of nutrition, but are costly to measure since they require special equipment and well-trained staff. Moreover, they have low specificity since growth can be influenced by many factors. Some growth measures, such as height, are best measured in the long term, which is not always practical for typical project and evaluation timeframes. Systematic administrative data on height and weight is uncommon and population-level data is typically only collected every five years, making these indicators unsuitable for monitoring. These measures include:
  - Height/length-for-age
  - Weight-for-age
  - Head and arm circumference
- **Anemia**: Anemia is an objective measure of nutrition but requires a finger prick, specialized equipment, and training, which may not be practical for most projects. Moreover, anemia has many causes that are not affected by WASH.
- **Helminth and protozoa infection**: Stool samples can be collected and tested in a laboratory for presence of soil-transmitted helminths and protozoans.
- **Other biomarkers**: New methods for analyzing stool samples can predict long-term nutritional outcomes, and noninvasive saliva samples can be tested for the presence of antibodies to common diarrheal disease pathogens. Further research is needed to establish validity and reliability of these measures.

IX. Addressing WASH through Nutrition Projects

Where alleviating the burden of undernutrition has proven to be a stubborn challenge, environmental hygiene solutions could be the binding constraint to improving nutrition outcomes. Therefore, nutrition interventions that address environmental hygiene practices and behaviors, such as handwashing with soap and use of latrines, as key determinants of nutritional outcomes can increase nutritional impact.

Current Status

A review of the health portfolio for fiscal years 2005 through 2014 (n = 372) resulted in a total of six projects with cross-sectoral coding in water supply (WC), sanitation (WA), or general water and sanitation (WZ). WASH-specific objectives specified in these projects included expanding coverage of improved water supply and sanitation and improving WASH practices and behaviors. Importantly, these projects measured WASH outcomes as part of the project results framework, including in some cases access to improved sanitation and water supply.

Although the number of projects is small (1.6 percent of all health projects over the past decade) they illustrate a number of potential approaches to multisectoral action. For example, the Sunaula Hazar Din Community Action for Nutrition Project in Nepal, which targets high population areas with high stunting and poverty levels, will mobilize communities to discuss nutritional challenges and commit to achieving specific nutritional goals within a 100-day period. A "menu of goals" includes nutrition-specific objectives around exclusive breastfeeding for six months, immunizations, and weight gain for children who are underweight, as well as nutrition-sensitive interventions for communities becoming open defecation free (ODF), access to school latrines, and hygiene knowledge. The project targets various risk factors for undernutrition, focusing on interventions where the evidence of impact on nutritional status is strongest.

Taking It Further

Nutrition interventions commonly include hygiene components that provide information or promotion of handwashing with soap, safe water, and sanitation. A handwashing demonstration is often included in infant and young child feeding interventions, including breastfeeding and complementary feeding. These interventions may also discuss the importance of using safe water in food preparation. More recently, the WASH sector has been working with nutrition, social protection, and other poverty-reduction efforts to incorporate promotion of household sanitation and latrine usage. Incorporation of sanitation demand generation into the Poverty Reduction Fund II in Lao PDR is expected to result in substantial cost savings by using the existing platform for reaching remote rural villages. Specifically, the project will finance training, travel costs, CLTS triggering events, and ODF verification to be conducted by the environmental health arm of the MoH National Center for Environmental Health (Nam Saat). In the Philippines, the WASH sector will leverage *Pantawid Pamilya,* the largest national antipoverty and social protection program in the country, to incorporate an enhanced sanitation module into family development sessions to provide information on the benefits of sanitation and incorporate evidence-based behavior change messages.

X. Summary and Next Steps

There is sufficiently robust evidence that improved WASH impacts nutrition, and the use of evidence-based guidance, instruments, and incentives can help task teams to maximize nutritional impacts. At the same time, more evidence is needed on operational approaches that are effective and cost-effective. For instance, there is little knowledge of the duration or intensity of WASH interventions that are required to achieve nutritional impact, whether WASH interventions in combination or alone can achieve health impact, and how task teams can prioritize these different interventions. There is little experience to date with integration of WASH into community-driven development, conditional cash transfers, and other results-based financing approaches, and how these projects might affect nutrition outcomes. Experimental and quasi-experimental impact evaluations are the best mechanisms to answer these questions; however, tacit knowledge and experience can help inform task teams in the short term.

The annex, "Building the Evidence and Knowledge Base," presents a preliminary list of policy and research questions to help address these knowledge gaps.

Coordination between the WASH and nutrition sectors, especially at the preparation and design phases, can help ensure that nutritional considerations are addressed, appropriate target groups prioritized, and where possible, objective indicators are used to measure nutritional impact. Similarly, nutrition projects can readily borrow from the software elements of WASH interventions to address key determinants of undernutrition.

This note presents some promising approaches to make WASH projects more nutrition-sensitive with the overall objective to increase development impact and end extreme poverty. However selectivity is needed—not *all* WASH projects can or should operate with nutritional considerations. However, having in mind nutritional considerations can help guide task teams to adopt nutrition-sensitive approaches to project and policy design where appropriate. Moreover, closer coordination between the WASH and nutrition sector can facilitate identification of projects that would benefit from a nutrition-sensitive approach or those that could increase effectiveness on nutritional outcomes by incorporating selected elements of WASH interventions.

Following a handwashing program, children at a school in West Java, Indonesia, wash their hands with soap. Photo: Sheryl Sliverman / World Bank

Annex: Building the Evidence and Knowledge Base

A set of initial research and policy knowledge gaps emerge from this review, spanning three broad areas: (i) direct and indirect effects of WASH on child nutrition outcomes; (ii) effectiveness and cost-effectiveness of nutrition-sensitive WASH interventions; and (iii) how to strengthen nutrition impacts in WASH operations.

i. **Direct and indirect impacts of WASH on child nutrition outcomes.** Despite the strength of available evidence, there are still unresolved questions on the impact of WASH on stunting, low weight-for-age, and anemia:
   - What is the impact of improved water, sanitation, and hygiene, alone and in combination, on child nutrition outcomes?
   - What is the relative importance of diarrhea, anemia, environmental enteropathy, and helminth infection caused by WASH on child nutrition outcomes?
   - What are the impacts of WASH on nutrition outcomes mediated through household time savings and productivity?
   - What are the impacts of WASH on income poverty and how do these influence nutrition outcomes?
   - What are the pathways of fecal contamination and exposure in the household?
   - What is the relative importance of animal and human feces for infection and child nutrition outcomes?

ii. **Effectiveness of nutrition-sensitive WASH interventions on child nutrition outcomes.** There are few effectiveness studies evaluating the impacts of nutrition-sensitive WASH. Further evidence is needed, particularly at a large scale, on the relative effectiveness of nutrition-sensitive approaches to business as usual:
   - What is the impact of sanitation promotion combined with CCTs on nutrition outcomes? How can financial incentives tied to program conditionalities increase adoption of sanitation and improve nutrition for program beneficiaries?
   - What are the costs and relative cost-effectiveness of nutrition-sensitive WASH interventions compared with business-as-usual on health and nutrition outcomes?
   - What are the costs and relative cost-effectiveness of nutrition interventions that incorporate WASH components on child nutrition outcomes?
   - What is the impact of geographic and/or demographic targeting of vulnerable populations for WASH operations with a goal of improving child nutrition?
   - What is the impact on child nutrition outcomes of results-based financing approaches that link water supply and sanitation subsidies to health seeking behavior, appropriate childcare behaviors, and growth monitoring?

iii. **How to strengthen nutrition impacts in WASH operations.** Further evidence is needed on how to increase impacts of WASH on nutrition outcomes, through improved program design, implementation, monitoring, and evaluation:
   - What are efficient and reliable measures of the impact of WASH on child health that can effectively be integrated in WASH operations?
   - How can operations improve the efficiency of behavior change interventions that target multiple behaviors?
   - What is the required duration and intensity of nutrition-sensitive WASH interventions to achieve nutrition and health impact?
   - How can WASH interventions be prioritized for integration with nutrition?
   - How can WASH elements be efficiently and effectively integrated into nonwater projects such as nutrition as well as poverty reduction/CDD and social protection projects?

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