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Baseline Report: Impact Evaluation of the Cambodia Integrated Nutrition, Hygiene, and Sanitation Project

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COVER PHOTO

Caption: Enumerator team taking length measurements of young child in Pursat, Cambodia.

Credit: Pheak Chhoun, KHANA Field Coordinator

BASELINE REPORT

IMPACT EVALUATION OF THE CAMBODIA INTEGRATED NUTRITION, HYGIENE, AND SANITATION PROJECT

Contracted under AID-OAA-M-13-00017

E3 Analytics and Evaluation Project

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ACRONYMS

CCT	Conditional Cash Transfer
CI	Confidence Interval
CLTS	Community Led Total Sanitation
cRCT	Cluster Randomized Controlled Trial
CTRL	Control Group (used only in tables and figures)
DHS	Demographic and Health Survey
E3	Bureau for Economic Growth, Education, and Environment (USAID)
EED	Environmental Enteric Dysfunction
FANTA	Food and Nutrition Technical Assistance Project
FTF	Feed the Future
GHI	Global Health Initiative
HARVEST	Cambodia Helping Address Rural Vulnerabilities and Ecosystem Stability
HAZ	Height-for-Age Z-score
HH	Household (used only in tables and figures)
ICC	Intra-cluster Correlation Coefficient
JMP	Joint Monitoring Program (WHO/UNICEF)
MDES	Minimum Detectable Effect Size
MSI	Management Systems International
NUTR	Nutrition only Group (used only in tables and figures)
NUTR+SAN	Nutrition and Sanitation/Hygiene Group (used only in tables and figures)
RCT	Randomized Controlled Trial
SAN	Sanitation/Hygiene only Group (used only in tables and figures)
SBCC	Social and Behavior Change Communication
SD	Standard Deviation
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VHSG	Village Health Support Group
WASH	Water, Sanitation, and Hygiene
WAZ	Weight-for-Age Z-score
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

EXECUTIVE SUMMARY

This Baseline Report corresponds to the impact evaluation of the Cambodia Integrated Nutrition, Hygiene, and Sanitation NOURISH project that the Office of Water in the United States Agency for International Development's Bureau for Economic Growth, Education, and Environment (USAID/E3) commissioned. The evaluation incorporates a cluster randomized controlled trial (cRCT) with a factorial design to rigorously test how effective integrating sanitation and hygiene along with nutrition services is in improving child linear growth and related child health outcomes, as well as whether this integrated approach is more effective than stand-alone nutrition or sanitation/hygiene interventions.

The baseline findings show a snapshot of key demographics, household characteristics, outcome variables, and balance on most of these variables across the four groups. Since assignment to the treatment and control groups was randomized, any differences between the groups are due to chance and not to the treatment itself, and can be adjusted for in the endline analysis. The evaluation team also examines variables associated with child linear growth and stunting.

NOURISH Project Description

The NOURISH project aims to address the key causal factors of chronic undernutrition specific to Cambodia: poverty, lack of access to quality nutrition services, unsanitary environments, and social norms and practices that work against optimal growth and development. It promotes essential nutrition and sanitation/hygiene behaviors with the aim of reducing stunting in children under two and improving the nutritional status of mothers in rural areas. NOURISH is being implemented by Save the Children (in collaboration with two international organizations, SNV and the Manoff Group, and three local partners) in three provinces (Battambang, Pursat, and Siem Reap) from June 2014 to June 2019. It focuses on women and children during the first 1,000 days, from the start of pregnancy until the child's second birthday.

NOURISH interventions are focused on four key strategies: (1) improving community delivery platforms to support improved nutrition; (2) creating demand for nutrition/health and sanitation/hygiene-related practices, services, and products through the use of conditional cash transfers (CCTs), community-led total sanitation (CLTS), vouchers, and social and behavior change communication (SBCC); (3) using the private sector to advance supply of sanitation and nutritious products; and (4) building the capacity of government and civil society in nutrition.

Evaluation Design

The NOURISH impact evaluation is based on the development hypothesis that integrated nutrition and sanitation/hygiene interventions lead to improved child linear growth that is greater than what is achieved when either intervention is delivered individually.

USAID's central questions for this impact evaluation are:

1. Do nutrition interventions, as delivered at scale, lead to improved linear growth in children?
2. Does expanded access to sanitation lead to improved linear growth in children?
3. Is the combined effect on linear growth in children of sanitation and nutrition interventions delivered together greater than the additive effect of the two interventions delivered independently?

Linked to the three impact questions are several subordinate questions that require the evaluation to look closely at the project implementation process (fidelity and compliance) and its intended results.

These questions provide insights on the intermediate outcomes from the different causal pathways through which NOURISH is aiming to increase the health status of children.

This impact evaluation consists of a cRCT design. The evaluation team randomly assigned 55 target communes to four groups, whereby the NOURISH interventions are offered both as separate components and as an integrated program. This factorial design results in four groups—(1) nutrition only, (2) sanitation/hygiene only, (3) nutrition+sanitation/hygiene, and (4) control—to allow the evaluation team to answer the main impact evaluation questions. Randomization was done at the commune level (clusters) to contain spillovers across villages and to prevent cross-group contamination.

Baseline Data Collection

The evaluation team conducted baseline data collection in September 2016. This consisted of anthropometric measures to calculate the primary outcomes—height-for-age z-score (HAZ), weight-for-height z-score (WHZ), and weight-for-age z-score (WAZ)—of children under 24 months, and an approximately 20-minute survey to the primary caregiver to collect data on key factors associated with stunting in Cambodia. The evaluation team also collected data regarding sanitation coverage and access to and treatment of water from additional households in the same areas using a 10-minute survey and structured observation. The evaluation team developed the survey questionnaire, and the majority of questions are based on validated questions from the Cambodia Demographic and Health Survey (DHS) questionnaires.

The National Ethics Committee for Health Research in the Cambodian Ministry of Health reviewed and approved the baseline protocols. The baseline sample size consisted of 3,877 households with at least one child under 24 months of age and 4,036 total children under 24 months of age. The response rate was high, at 97 percent of all valid households reached.

Key Findings

The key findings from the baseline study are as follows.

Revisiting Power Calculations

The evaluation team used the baseline data to test the intra-cluster correlation (ICC) assumption and redo the power calculations to get a more precise estimate of the minimum detectable effect size (MDES). The Evaluation Design Proposal used an ICC assumption of 0.01 on the HAZ outcome variable at the commune level. The actual ICC, using baseline data, is 0.014, which results in a slightly larger MDES. Using this updated parameter and keeping sample size constant so as not to further increase costs, the study has sufficient power to detect an MDES of 0.19 for differences in HAZ scores between treatment groups and an MDES of 0.18 for differences between each treatment group and the control group. Using the actual baseline HAZ mean of -0.96 and standard deviation of 1.187, this translates to a 23.4 percent change in HAZ scores between treatment groups, and a 22.2 percent change in HAZ scores between treatment and control groups. Despite these revisions, the evaluation is still well positioned to measure changes anticipated by NOURISH.

Baseline Characteristics

This baseline report shows a snapshot of key demographics, household characteristics, and outcome variables for each of the study groups. The four study groups are balanced across a range of characteristics of the households, primary caregivers, and their children under age 2. While there are

differences in certain indicators, adjustments to the endline analysis can be made to account for these differences at the baseline.

By the time of the baseline survey, some NOURISH activities had started in 12 communes, representing one-third of the treatment communes. While exposure to these nutrition and sanitation/hygiene-related products and activities could affect behavior, the evaluation team does not expect this to be a major threat to the integrity of the baseline because of the likely time lag between the initiation of activities and their impact on outcomes. The team also does not expect key outcomes such as stunting to have been affected by the activities in that time period. Moreover, the evaluation team randomized assignment to the four study groups before the start of any NOURISH activities, so any differences in exposures to these activities across the study groups, measured at baseline, do not pose a threat to the validity of the evaluation design.

Regarding child linear growth and nutrition at baseline, anthropometric measures show that the average HAZ score for the study area is -0.96 standard deviation (SD) below the mean of the World Health Organization (WHO) reference population. Overall, 16.3 percent of children under age 2 are stunted. Analysis by age group shows that stunting is apparent even among children 0 – 5 months old (8.0 percent). In general, stunting increases with the age of the child, rising from 12.8 percent among children 6 – 8 months old to 28.8 percent among children 18 – 23 months old. Also, boys (18.3 percent) are more likely to be stunted than girls (14.5 percent). The prevalence of stunting is also higher among children living in the poorest households (21.6 percent) than among children in the richest households (10.6 percent). The average WHZ score for the study area is -0.61 SD below the mean of the WHO reference population. Overall, 8.1 percent of children under age 2 are wasted. Wasting prevalence patterns are inconsistent by age of the child and by wealth quintiles. Boys (10.5 percent) are more likely to be wasted than girls (5.6 percent). About one-fourth of children had diarrhea in the week preceding the survey. The occurrence of diarrhea varies by the age and sex of the child. Boys are more likely to have had diarrhea in the past week than girls, and younger children, especially those 6 – 8 months old, around the point of weaning, are more prone to diarrhea than children in the older age cohorts across all study groups. These baseline conditions show ample room for improvement from NOURISH nutrition activities.

Regarding water, sanitation, and hygiene (WASH) coverage at baseline, access to an improved water source is particularly high (74 percent) since data were collected during the rainy season. However, only 52 percent of households always treat their water to make it safer to drink. Access to an improved sanitation facility is 39 percent in the study area. However, there is a wide distribution of village-level improved sanitation coverage rates, with about 40 percent of villages across the study groups with improved sanitation coverage rates of less than 25 percent and about 70 percent of villages across the study groups with rates of less than 50 percent. Open defecation remains prevalent, with 35 percent of households still practicing it. At the village level, about 40 percent of villages have open defecation rates between 25 and 75 percent; but more positively, about 50 percent of villages have open defecation rates of less than 25 percent. These baseline sanitation conditions show that NOURISH is implementing activities in areas that still have plenty of room for increasing latrine construction and reaching open defecation free status. The challenge, however, centers on increasing improved sanitation coverage and lowering open defecation rates in as many villages as possible across the treatment communes by a sufficient amount so that changes in primary and secondary outcomes can be detected.

Variables Associated with Child Linear Growth and Stunting

The evaluation team also used the baseline data to examine variables associated with child linear growth and stunting. Holding other factors constant, child stunting shows a statistically significant association with the child's sex and age, weight at birth, episode of diarrhea in the week before the survey, paternal

education, and household wealth. These same variables are associated with child linear growth, in addition to currently breastfeeding, number of household members, and improved sanitation facility. While diarrhea and improved sanitation coverage are separately associated with child linear growth (HAZ score), improved sanitation coverage is not directly associated with diarrhea. This may be because while several key pathogens have been identified as important etiological agents of moderate to severe diarrheal disease affecting children in Cambodia, many others may be common asymptomatic infections not resulting in a diarrhea episode. Moreover, these asymptomatic infections may be closely linked with reduced gut function, reduced nutrient absorption, and reduced linear growth. Thus, this impact evaluation will collect children's stool samples, at endline, to measure the prevalence of enteric infections (both symptomatic and asymptomatic) rather than relying on self-reported diarrhea. Collecting data on this secondary outcome measure has the potential to make a significant contribution to the evidence base on the interaction effects between sanitation and faltering child growth.

Conclusions

The baseline data show that NOURISH interventions have the potential to improve key indicators potentially linked to stunting. There is room for increased uptake of nutrition interventions such as home visits from a village health agent or participation in village-level "first 1,000 days" activities. Given that household wealth is associated with child health and nutrition, interventions that aim to increase a household's purchasing power such as the CCT program and vouchers for the latrine components, water filters, and food baskets are valuable. Birth weight is also an important factor associated with faltering growth, so activities targeting pregnant women, including CCT incentives to make at least four antenatal visits to a public health center and to have adequate weight gain and diet during pregnancy, are important. Improvements in infant and young child feeding practices are another area where NOURISH can make a difference. While early breastfeeding is nearly universal, continued breastfeeding starts to fall sharply after a child's first year. Food dietary diversity is mostly driven by the consumption of grains, flesh meat, and vitamin A rich produce, with very little consumption of dairy and eggs (dairy is not part of the local diet).

On the sanitation side, there is room for increased participation in a CLTS activity. It will be particularly important for the NOURISH team to continue linking supply-side sanitation activities to the CLTS demand-generating activities so that improved sanitation coverage increases enough to measure changes in outcomes. WASH conditions and behaviors, such as consistent drinking water treatment, adequate use of handwashing with soap, and access to an improved sanitation facility also have room for improvement. Moreover, the risk of fecal-oral contamination for children remains high, with open defecation and inadequate disposal of young children's stool still being common. Given that improved sanitation coverage varies substantially by wealth quintile, NOURISH's efforts to target poorer households will have the most value-added.

The evaluation team will continue to monitor the implementation fidelity of the NOURISH interventions on a quarterly basis to track the exposure threshold points defined in collaboration with NOURISH and USAID. Once the exposure thresholds have been met, the 24-month period toward endline measurement will commence. The endline survey will be more extensive than the baseline survey, collecting data to more detailed questions and on additional outcomes that were defined in the Evaluation Design Proposal but were not part of the baseline. In particular, the endline will include more detailed questions on latrine use, sanitary conditions of the household environment, and uptake of key infant and young child feeding, hygiene, and sanitation practices. The achievement of gross motor skills will provide insights into early childhood development. In addition to conducting a survey, the evaluation team will collect children's stool samples to measure the prevalence of both symptomatic and asymptomatic enteric infections. This secondary outcome is more proximal than stunting (primary outcome) on the causal chain, and is also an objective measure that is more reliable than self-reported

diarrhea (tertiary outcome). However, analysis of the stool samples also adds significant cost to data collection and analysis. Given budget considerations, analyses of two other secondary outcomes—(1) measures of environmental enteric dysfunction (EED), or gut function, which may be the primary mechanism linking WASH and undernutrition, and (2) soil-transmitted helminth infections—will be conducted only if additional funds are secured in the future.

INTRODUCTION

This Baseline Report corresponds to the impact evaluation of the Cambodia Integrated Nutrition, Hygiene, and Sanitation NOURISH project that the Office of Water in the United States Agency for International Development's Bureau for Economic Growth, Education, and Environment (USAID/E3) commissioned. The E3 Analytics and Evaluation Project designed and is implementing the impact evaluation.[1] The evaluation incorporates a cluster randomized controlled trial (cRCT) with a factorial design to rigorously test how effective integrating sanitation and hygiene along with nutrition services is in improving child linear growth, as well as whether this integrated approach is more effective than stand-alone nutrition or sanitation/hygiene interventions.

This document provides the findings from the baseline data collection, showing a snapshot of key demographics, household characteristics, outcome variables, and balance on most of these variables across the four groups. Since assignment to the treatment and control groups was randomized, any differences between the groups are due to chance and not to the treatment itself. Thus, there is no selection bias in the design, and the endline analysis can adjust for the baseline differences. The evaluation team also examines variables associated with child linear growth and stunting.

NOURISH DESCRIPTION

Background

Despite strong economic growth and rising living standards in the last two decades, high levels of undernutrition persist in Cambodia. The most recent national estimates from 2014 show that up to 32 percent of children under five years are stunted and 9 percent are severely stunted.[2] Nutrition interventions that aim to ensure adequate dietary intake alone have not been successful in eliminating stunting,[3] suggesting the need for additional complementary interventions—such as water, sanitation, and hygiene (WASH)—that might act synergistically to accelerate progress in nutrition.[4] This nutrition and sanitation nexus has also been recognized by current USAID strategies, including the Water and Development Strategy and the Multi-Sectoral Nutrition Strategy, which emphasize the relevance of WASH to nutrition and call on Missions to add WASH as key elements to their health and nutrition activities.

NOURISH Overview

To help identify how nutrition and sanitation/hygiene interventions can best be mobilized together, USAID awarded Save the Children to implement NOURISH in Cambodia.[5] This five-year, $16.3 million project addresses several Global Health Initiative (GHI) and Feed the Future (FTF) initiative priorities by focusing on the key causal factors of chronic undernutrition specific to Cambodia: poverty, lack of

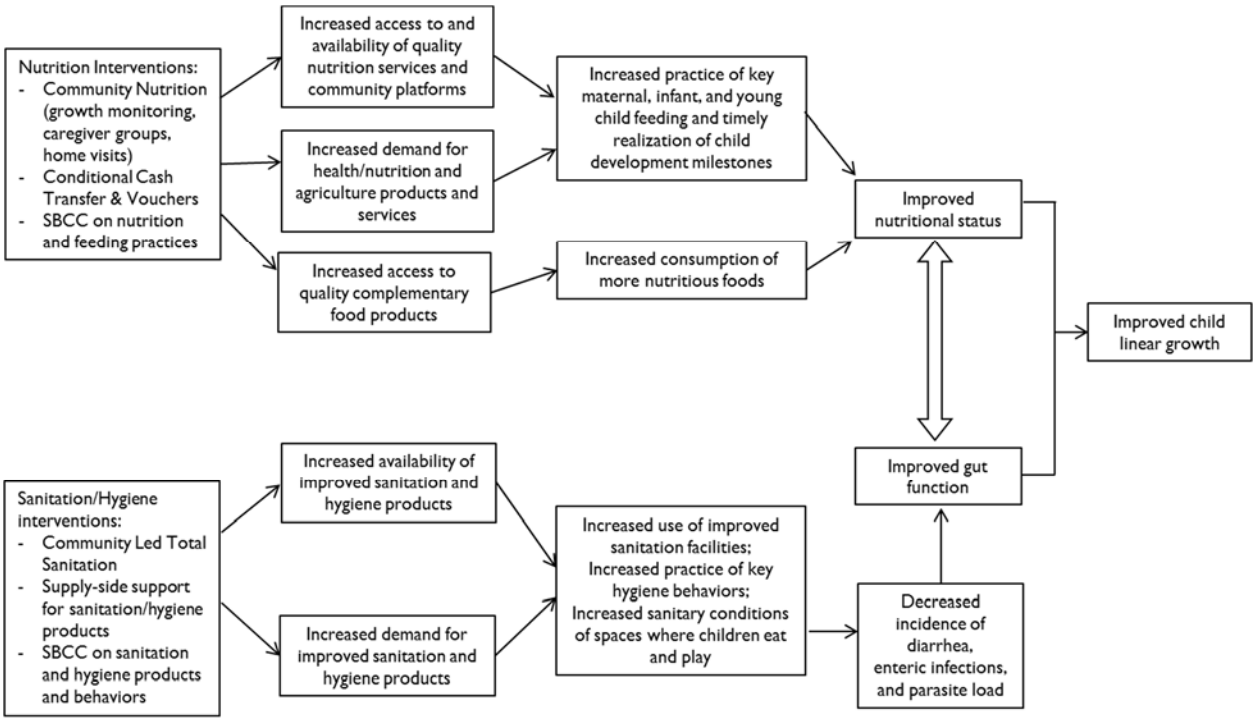
[1] The E3 Analytics and Evaluation Project team consists of a team lead, Management Systems International (MSI), and team partners Development and Training Services (dTS) and NORC at the University of Chicago.
[2] National Institute of Statistics, Directorate General for Health, and ICF International. "Cambodia Demographic and Health Survey 2014." (2015).
[3] Kathryn G. Dewey and Seth Adu-Afarwuah, "Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries," *Maternal & Child Nutrition*, 4, no. S1 (2008).
[4] Marie T. Ruel and Harold Alderman, "Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?," *The Lancet*, 382, no. 9891 (2013).
[5] Save the Children is implementing NOURISH in collaboration with two international organizations (SNV and the Manoff Group) and three local partners.

access to quality nutrition services, unsanitary environments, and social norms and practices that work against optimal growth and development. It promotes essential nutrition and sanitation/hygiene behaviors with the aim of reducing stunting in children under 2 years old and improving the nutritional status of mothers in rural areas. NOURISH is being implemented in three of the four FTF zone of influence provinces (Battambang, Pursat, and Siem Reap) from June 2014 to June 2019. It is being phased into approximately 70 communes in these provinces, targeting women and children during the first 1,000 days, from the start of pregnancy until the child's second birthday.

NOURISH Interventions

NOURISH interventions are focused on four key strategies: (1) improving community delivery platforms to support improved nutrition; (2) creating demand for nutrition/health and sanitation/hygiene-related practices, services, and products through the use of conditional cash transfers (CCTs), community-led total sanitation (CLTS), vouchers, and social and behavior change communication (SBCC); (3) using the private sector to advance supply of sanitation and nutritious products; and (4) building the capacity of government and civil society in nutrition. These components form the inputs of the project framework laid out in Figure 1. Further details on the interventions can be found in Annex A.

FIGURE 1: NOURISH FRAMEWORK



Development Hypotheses

The inputs of the NOURISH framework above are expected to follow pathways of change to bring about the intended results. These outcome pathways can be restated as three development hypotheses:

- *Hypothesis #1:* Nutrition interventions increase the practice of key feeding behaviors and consumption of more nutritious foods, leading to improved child linear growth.
- *Hypothesis #2:* Sanitation and hygiene interventions reduce diarrhea and enteric infections and promote gut health, leading to improved child linear growth.

- *Hypothesis #3:* Integrated nutrition and sanitation/hygiene interventions lead to improved child linear growth that is greater than what is achieved when either intervention is delivered individually.

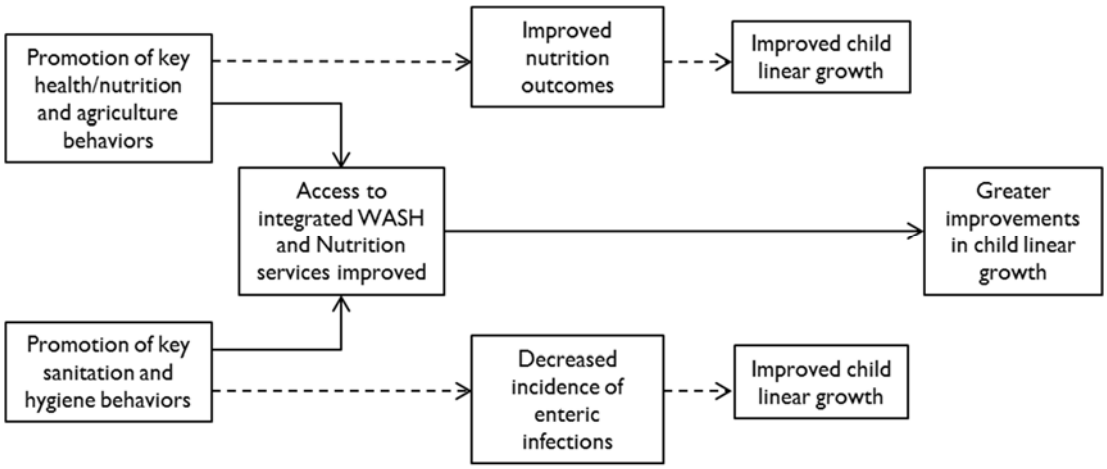
EVALUATION PURPOSE AND EVALUATION QUESTIONS

This impact evaluation comes at an opportune time, as the previously noted USAID strategies call for more integration of WASH and nutrition activities while also recognizing that additional research is needed to strengthen the evidence base for the nutrition linkages to WASH. While USAID and other actors in international development have been exploring different approaches for integrating WASH and nutrition interventions on the basis of the emerging understanding of the link between enteric infections and nutrient uptake,[6] no rigorous evidence exists on the potential health impacts of combining improved WASH and nutrition interventions under real-world conditions. See Annex B for a review of the existing evidence.

Two groups of evaluation questions guide this evaluation. The first set of questions focuses on causality, or the attribution of detected effects to the USAID interventions. The second set of evaluation questions focuses on process, or whether project activities and the incentive schemes used by NOURISH result in the intended intermediate outcomes.

The development hypotheses for this project are displayed graphically in Figure 2 highlighting each of the intended results of the NOURISH project framework (shown in Figure 1) and the presumed causal linkages (arrows). This theory of change diagram focuses on how increased access to integrated nutrition and sanitation/hygiene interventions can have synergistic dynamics that lead to greater improvements in child linear growth than individual interventions.

FIGURE 2: THEORY OF CHANGE



Impact Questions (Causal Linkages)

USAID's central questions for this impact evaluation, which encompass the three development hypotheses above, are:

[6] Oliver Cumming and Sandy Cairncross, "Can water, sanitation and hygiene help eliminate stunting? Current evidence and policy implications," *Maternal & Child Nutrition*, 12, no. S1 (2016).

1. Do nutrition interventions, as delivered at scale, lead to improved linear growth in children?
2. Does expanded access to sanitation lead to improved linear growth in children?
3. Is the combined effect on linear growth in children of sanitation and nutrition interventions delivered together greater than the additive effect of the two interventions delivered independently?

Rigorously examining these questions requires a "factorial design" whereby the intervention components can be assessed separately and together.

Project Process Questions

Linked to the three impact questions are several subordinate questions that require the evaluation to look closely at the project implementation process (fidelity and compliance) and its intended results. These questions provide insights on the intermediate outcomes from the different causal pathways through which NOURISH is aiming to increase child linear growth. Given that NOURISH interventions comprise multiple sanitation and nutrition components, these additional questions will provide important insights into the relative contribution of these various components to improving child linear growth. The project process evaluation questions are:

1. Did sanitation interventions increase improved sanitation coverage and usage?
2. Did nutrition interventions increase take-up of nutrition and early childhood development services?
3. Did the nutrition and sanitation interventions change knowledge, attitudes, and practices on nutrition, hygiene, and infant and young children feeding practices?
4. Did the sanitation interventions lead to more sanitary conditions of the home environment?

Table 1 describes the key outcome measurements collected at baseline. The survey instrument section below further describes the relevant covariates and other possibly predictor variables of faltering child growth. Baseline data collection focused on key outcomes and relevant covariates that might be associated with these outcomes. The endline survey will collect more detailed and extensive data on all outcomes and intermediate outcomes as outlined in the Evaluation Design Proposal.

TABLE 1: KEY OUTCOME MEASURES

Indicator	Measurement	Interpretation
Height-for-age z-score (HAZ)	Standardized measure of child's height for his/her age, as compared to the mean of the 2006 WHO reference population. Mean of 0 and standard deviation of 1.	This is an indicator of linear growth. Children with a HAZ score below minus two standard deviations from the mean of the reference population are considered stunted and are chronically undernourished. Chronic undernutrition carries long-term developmental risks. Stunting is frequently found to be associated with poor overall economic conditions, especially mild to moderate, chronic, or repeated infections, as well as long periods of inadequate nutrient intake.
Weight-for-height z-score (WHZ)	Standardized measure of child's weight for his/her height, as compared to the mean of the 2006 WHO reference population. Mean of 0 and standard deviation of 1.	This is an indicator of body mass in relation to body length and describes current nutritional status. Children with a WHZ score below minus two standard deviations from the mean of the reference population are considered thin (wasted) for their height and are acutely malnourished. Acute undernutrition carries an immediate increased risk of morbidity and mortality. Wasting is often associated with variations either in food supply or in disease prevalence. One of the main characteristics of wasting is that it can develop very rapidly, and under favorable conditions can be reversed rapidly.
Weight-for-age z-score (WAZ)	Composite index of HAZ and WHZ. Mean of 0 and standard deviation of 1.	This reflects a combination of chronic and acute undernutrition. Children with a WAZ score below minus two standard deviations from the mean of the reference populations are considered underweight.
Self-reported diarrheal disease	Child had diarrhea in the last 7 days or in the last 2 weeks. Diarrhea is defined as three or more loose or liquid stools in a 24-hour period or any stool with blood. A visual aid card pointing to the two types of stool classified as diarrhea was used during each survey interview.	Diarrheal disease is thought to be the primary mediating pathway between sanitation and stunting. It is both a cause and an effect of undernutrition: children with diarrhea eat less and are less able to absorb the nutrients from their food, and in turn malnourished children are more susceptible to diarrhea and other infections. This poor nutrient absorption may lead to stunted linear growth.

EVALUATION DESIGN AND METHODOLOGY

This impact evaluation consists of a cRCT design. The evaluation team randomly assigned 55 target communes to treatment and control groups; the treatment groups receive exposure to the relevant NOURISH component (or components), and the control group remains unexposed. Assignment to treatment and control groups was randomized at the commune level (clusters) to contain spillovers across villages and to prevent cross-group contamination. Under this design, all villages within each treatment commune receive the assigned NOURISH component for their respective commune.

To assess the independent and combined effects of the NOURISH interventions and to test whether an integrated approach leads to greater improvements in child linear growth beyond the stand-alone nutrition and sanitation/hygiene bundles, the evaluation team implemented a controlled factorial design. Thus, there are four separate arms—(1) nutrition only, (2) sanitation/hygiene only, (3) nutrition+sanitation/hygiene, and (4) control—to allow the evaluation team to answer the main impact evaluation questions. Table 2 shows the NOURISH implementation design.

TABLE 2: NOURISH IMPLEMENTATION DESIGN FOR THE IMPACT EVALUATION

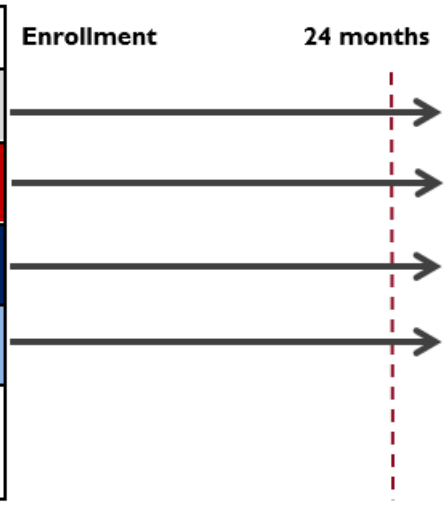
Control Group: No project activities*	**Treatment 1:** Nutrition interventions: • Community nutrition (growth monitoring, caregiver groups, and home visits) • SBCC package • CCT and integrated vouchers
Treatment 2: Sanitation/Hygiene interventions: • CLTS • Supply-side support • SBCC package	**Treatment 3:** Nutrition and sanitation/hygiene interventions

* The SBCC strategy includes four television spots, so communes in the control group may be exposed to some information via these television spots. However, beyond the television spots and visible campaign branding, these control communes will not receive direct SBCC messaging from the village health support group (VHSG) or any other NOURISH-related activities.

Given the phased roll-out of NOURISH activities into all treatment communes, the evaluation team will wait until all treatment communes have been reached before conducting endline data collection. Thus, 24 months after all treatment communes are deemed "exposed" to their respective project components, the evaluation team will collect measurements from young children (born from the point of intervention up to 18 months before the endline) in all 55 communes. **Error! Reference source not found.** illustrates the implementation roll-out plan and evaluation timeline.

TABLE 3: RCT DESIGN TIMELINE

	Year 2 (2015 - 2016)	Year 3 (cum.) (2016 - 2017)
Control	19	19
Nutrition Only	2	11
Sanitation Only	4	13
Nutrition + Sanitation	6	12
Total communes receiving *any* NOURISH interventions:	12	36



Study Sampling Area and Randomization

The universe of communes to be targeted by NOURISH was selected based on the following criteria: (1) communes where at least 30 percent of the population lives below the poverty line,[7] and (2) communes where latrine subsidies are not currently in place. From this list of eligible communes, 12

[7] According to the Cambodia Ministry of Planning's Commune Database (2011).

communes were excluded for pilot activities during Year 1 and an additional 12 were excluded due to commitments with the provincial governments. The remaining 58 communes were part of the initial universe that the evaluation team randomized in September 2015 into three treatment arms (39 communes) and a control group (19 communes) using Stata. NOURISH and USAID/Cambodia agreed to roll out project activities based on this randomized assignment.

In June 2016, NOURISH notified the evaluation team that three communes from the original list of 58 randomized communes would be excluded: one commune from the nutrition+sanitation/hygiene arm and two communes from the nutrition-only arm. These communes were excluded due to objections by local government and a perceived overlap with other current development programming. Thus, the current evaluation design includes 55 communes (see **Error! Reference source not found.**).

Sample Size and Power Calculations

The following assumptions were originally used to estimate the minimum detectable effect size (MDES) for the interventions:

- Power: 80 percent.
- Significance level: 95 percent (using a two-sided test).
- Baseline HAZ: Mean of -1.637 with a standard deviation 1.286, estimated from the 2014 Cambodia Demographic and Health Survey (DHS).
- Intra-cluster correlation coefficient (ICC): 0.01 on the HAZ outcome variable at the commune level, estimated from the Cambodia Helping Address Rural Vulnerabilities and Ecosystem Stability (HARVEST) baseline data. HARVEST has a more relevant sampling design to this evaluation than DHS.
- Increased allocation of eligible communes to the control arm, 19 communes (one-third of the total), to enhance statistical efficiency of multiple hypothesis testing,[8] similar to WASH-Benefits.

The three communes that were removed after randomization were not replaced and USAID decided to keep the sample size constant, resulting in a slight increase in the MDES. Nonetheless, this small increase in MDES is still in the range of other large existing trials.

Given the constraint on the number of available clusters (limited to 55 communes), the final sample size was chosen to balance the size of the study (a key determinant of cost) and the detectable difference between groups, resulting in a total of 4,015 children (consisting of 73 observations per cluster). These sample size calculations suggested that this study had sufficient power to detect a MDES of 0.18 for differences in the HAZ scores between treatment groups and a MDES of 0.17 for differences between each treatment group and the control group. While empirical evidence to serve as an adequate basis for the MDES is limited, the WASH-Benefits efficacy trial set its sample size to detect a similar HAZ MDES of 0.18 between treatment groups and a MDES of 0.15 in mean HAZ scores between treatment and control groups. Thus, the sampling approach and sample size are sufficient to allow the team to confidently measure changes anticipated by NOURISH.

Revisiting the Power Calculation Assumptions

The evaluation team used the baseline data to test the ICC assumption and redo the power calculations to get a more precise estimate of the MDES. The Evaluation Design Proposal assumed an ICC of 0.01 on the HAZ outcome variable at the commune level, based on the HARVEST baseline data. The actual ICC, using baseline data, is 0.014, which will result in a slightly larger MDES. Using this updated parameter and

[8] Joseph L. Fleiss, *The design and analysis of clinical experiments* (New York: Wiley, 1986).

keeping sample size constant so as not to further increase costs, **the study has sufficient power to detect a MDES of 0.19 for differences in HAZ scores between treatment groups and a MDES of 0.18 for differences between each treatment group and the control group**. Using the actual baseline HAZ mean of -0.96 and standard deviation of 1.187, this translates to a 23.4 percent change in HAZ scores between treatment groups, and a 22.2 percent change in HAZ scores between treatment and control groups. Despite these revisions, the evaluation is still well positioned to measure changes anticipated by the NOURISH project.

BASELINE DATA COLLECTION

While the communes were randomized into four study groups, there is a relatively small number of clusters per group, so any baseline imbalance in the primary outcomes and key covariates would need to be accounted for in the evaluation endline analysis. Originally, the evaluation team planned to use the baseline data collected by the NOURISH team in November 2015. However, due to a smaller sample size than originally planned, the evaluation team decided to collect its own baseline data on the primary outcome and key covariates only. Extensive data on all of the outcome measures to estimate the treatment effects will be collected during the endline. In particular, the endline survey will include more detailed questions on latrine use, sanitary conditions of the household environment, and uptake of key infant and young child feeding, hygiene, and sanitation practices.

The purpose of the baseline data collection is to provide a snapshot of the key outcome measures and relevant covariates across the four study groups before full roll-out of project activities. The endline analysis can account for any baseline differences across the groups. The evaluation team also examines the variables associated with child linear growth and stunting.

Baseline Sampling Methodology

The sampling frame consists of households within all of the 491 villages in the 55 evaluation communes. The baseline collected data from two different samples within these same communes. The main sample was randomly selected from households with at least one child under 2 years old. The secondary sample, which was used to estimate village-level WASH indicators, consisted of any household within these communes.

For the main sample, in order to collect reliable point-estimates of child growth at the group level, the required sample size was calculated based on a conventional approach for means at the 95 percent confidence level with a margin of error of +/-6 percent.

$$N = D_{eff} * \left[\frac{(Z * \sigma)}{ME}\right]^2 * 4 = 1.4 * \left[\frac{(1.96 * 1.286)}{0.098}\right]^2 * 4 = 3{,}705$$

where:
D_{eff} = design effect of 1.4, estimated using 2014 DHS data
Z = 1.96 (for 95% confidence level)
σ = child growth standard deviation of 1.286, estimated using DHS 2014 data
ME = 0.098, corresponding to margin of error of +/-6%

Dividing the minimum required sample of 3,705 by 491 villages results in 7.54 surveys per village. To ease logistics and provide a cushion for unexpected challenges, sample size was rounded up to 8 surveys per village, resulting in a target total of 3,928 main households, as shown in Table 3.

For the secondary sample, in order to collect reliable point-estimates of sanitation coverage at the group level, the required sample size was calculated based on a conventional approach for proportions, at the 95 percent confidence level with a margin of error of +/-5 percent.

$$N = p(1-p) * \left[\frac{Z}{ME}\right]^2 * 4 = 0.408(1-0.592) * \left[\frac{1.96}{0.05}\right]^2 * 4 = 1{,}024$$

where:
p = proportion of sanitation coverage of 0.408, estimated using DHS 2014 data
Z = 1.96 (for 95% confidence level)
ME = margin of error of +/-5%

Given the 491 villages, sample size was rounded up to three additional randomly selected households per village, for a target total of 1,473 additional households, as shown in Table 3.

TABLE 3: REQUIRED BASELINE SAMPLE

Provinces	Communes	Villages	HHs Main Sample	HHs Secondary Sample
Battambang	22	180	1,440	540
Pursat	6	83	664	249
Siem Reap	27	228	1,824	684
Total	**55**	**491**	**3,928**	**1,473**

Household Selection

Enumerator pairs met with the village leader at the beginning of each day to review or help develop a list of all households with at least one child under 24 months old. They entered the total number of households in the village with a child under 24 months old into a random number generator app to generate 12 numbers, the first 8 to be surveyed and the last 4 to serve as replacement households if 3 visits were unsuccessful. The enumerator pair then asked the village leader to draw a map of the village and mark where the randomly selected households were located.

To select households for the secondary sample, the enumerators did not randomly draw from a complete list of all households within each village because logistical and budgetary constraints prevented verification of the accuracy of the lists of all households in each village and displacement of the enumerators over widely dispersed geographic areas. Instead, enumerators used the third, fifth, and seventh households from the main sample as anchors for the secondary sample. From the third household in the main sample, they walked clockwise until reaching the third household from their starting point, and they selected this household for the secondary sample. They followed the same process from the fifth and seventh households in the main sample, walking clockwise until reaching the third household from their starting point. This resulted in three randomly selected households for the secondary sample. Since the eligibility criterion for the households in the main sample (i.e., having a child under 24 months old) is not correlated to the latrine situation of the other households, and the households in the main sample were randomly selected, this household selection process results in an unbiased sample. The enumerators visited all selected households at least three times before replacing them with another randomly selected household.

Survey Instrument

Baseline data collection consisted of anthropometric measures to calculate the primary outcomes (HAZ, WHZ, and WAZ) for children under 24 months old and an approximately 20-minute survey to the primary caregiver to collect data on key factors associated with stunting in Cambodia. The evaluation team also collected data from additional households in the same villages on sanitation coverage and access to and treatment of water through a 10-minute survey and structured observation. The evaluation team developed the survey questionnaire, and the majority of questions are based on validated questions from the Cambodia DHS questionnaires (see Annex C for complete surveys). Table 4 shows the survey questionnaire modules.

TABLE 4: SURVEY QUESTIONNAIRE MODULES

Modules	Indicators
I. Basic information from primary caregiver	• Age, religion, schooling, marital status • Spouse's schooling • Household size, number of adults and children
II. Basic information for children (0 – 24 months)	• Gender, birthdate, birth weight (document verification) • Breastfeeding
III. Child anthropometry measurements (0 – 24 months)	• Weight • Height
IV. Child health (diarrhea and other illness) (0 – 24 months)	• Vomit and abdominal pain • Diarrhea in last 7 days and in last 2 weeks • Duration and intensity of diarrheal episode
V. Child dietary diversity (6 – 24 months)	• Dietary intake from the previous day • Meal frequency
VI. Family size, pregnancy, and child births	• Antenatal care, currently pregnant • Total births, birth spacing • Child mortality
VII. Exposure to nutrition and sanitation/hygiene interventions in last 12 months	• Receipt of different nutrition and sanitation/hygiene related products • Participation in nutrition or sanitation village-level activities
VIII. Household WASH conditions	• Drinking water source, access, and treatment • Handwashing station (observation) • Sanitation facility (observation) • Disposal of child's stool
IX. Household characteristics	• Asset inventory • Fuel source • Floor, roof, and wall material (observation) • Number of rooms • IDPoor cardholder (document verification)

The National Ethics Committee for Health Research in the Cambodian Ministry of Health reviewed and approved the baseline protocols prior to the start of data collection. The evaluation team carried out the baseline data collection in September 2016 with a team of 42 paired enumerators, 4 supervisors, an anthropometry specialist, a field manager, and the MSI local coordinator. Additional data collection and data quality assurance protocols can be found in Annex D.

The sampling process resulted in the final sample sizes displayed in Table 5, with 3,877 completed surveys in the main sample and 1,464 in the secondary sample. The response rate was high, at 97 percent of all valid households reached. One of the challenges in finding valid households was obtaining

an accurate list of households with children under age 2, as some households initially approached had children slightly older than 24 months, making them ineligible for the survey. The evaluation team will address this challenge for the endline, potentially working more closely with the village health support group members rather than relying solely on the village leader. Coordination with village leaders will still occur ahead of data collection. Another challenge is that it has become increasingly common for families to migrate to Thailand or Vietnam for work, either seasonally or permanently, so these households are absent from the village for the duration of the survey. Given that this evaluation is not a panel design, migration is less of an issue for data collection but can be problematic if families with young children exposed to NOURISH activities migrate.

TABLE 5: BASELINE SAMPLE DISTRIBUTION

Sample	NUTR Only	SAN Only	NUTR + SAN	Control	Total
Communes	11	13	12	19	55
Villages	95	93	128	175	491
Total HHs surveyed	1,033	1,011	1,402	1,895	5,341
Total HHs with child under 24 months of age	743	740	1,019	1,375	3,877
Total mother respondents	670	691	926	1,257	3,544
Total children under 24 months of age	782	762	1,051	1,441	4,036

BASELINE FINDINGS

This section presents the baseline findings of key demographics, household characteristics, and outcome variables for each of the study groups. As previously stated, the evaluation team conducted the baseline survey to assess the balance of treatment and control groups given the limited number of clusters per group. The team will use this information, where appropriate, to adjust the endline analysis.

Since study group assignment was randomized, any difference across groups, no matter how extreme, is due to chance and not to the treatment itself.[9] While random assignment is successful in removing selection bias, any particular random allocation may not necessarily achieve balance on key demographic and outcome variables at baseline. However, this lack of balance can be accounted for in the endline analysis by including the baseline values of those variables in the model.

Following the CONSORT guidelines,[10] the evaluation team did not conduct significance tests of baseline differences, since these tests assess the probability that observed baseline differences could have occurred by chance; however, it is already known that any differences are caused by chance (since treatment allocation was randomized). Instead, this report shows means and 95 percent confidence intervals (CIs) for each variable by study group.[11]

Primary Caregiver Characteristics

Since the majority of the primary caregiver respondents are mothers of the target children under 2 years old (91.4 percent), this section reports only on mother respondents (n=3,544). The findings reported in Table 6 show that mothers are very similar across the four study groups; their average age

[9] Douglas G. Altman and Caroline J. Doré, "Randomisation and baseline comparisons in clinical trials," *The Lancet*, 335, no. 8682 (1990).
[10] Kenneth F. Schulz, Douglas G. Altman, and David Moher, "CONSORT 2010 Explanation and Elaboration: updated guidelines for reporting parallel group randomized trials," *BMJ,* 340 (2010).
[11] CIs are constructed from linearized standard errors, which are clustered at the village level and stratified by commune.

is approximately 27 years old, and almost all are married and Buddhist. Mothers in the control group are slightly less educated, with 16.6 percent having never attended school; this estimate is within the 95 percent CI of the sanitation/hygiene only and nutrition+sanitation/hygiene groups, but slightly over the 95 percent CI for the nutrition only group. Spouses in the control group and sanitation/hygiene only group are less educated, with 16.5 percent and 15.2 percent, respectively, having never attended school; this is within the 95 percent CI of the nutrition+sanitation/hygiene group, but slightly over the 95 percent CI for the nutrition only group. Figure 3 shows the schooling-level distribution for mothers and spouses.

FIGURE 3: PARENTAL HIGHEST LEVEL OF SCHOOL ATTENDED (%)

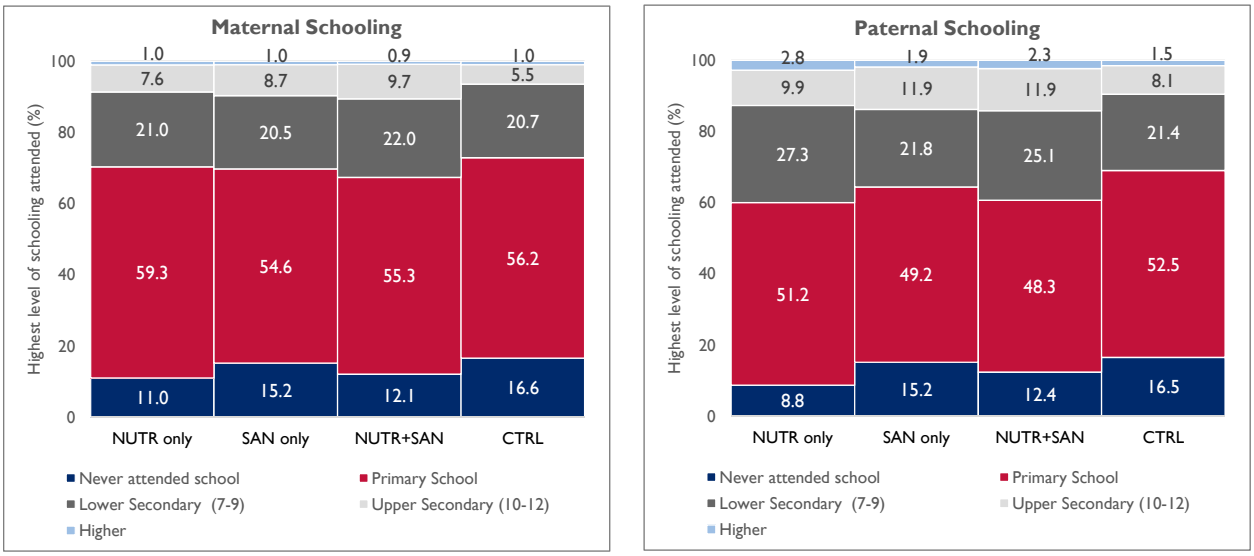


TABLE 6: PARENTAL CHARACTERISTICS

Characteristic	Mean (95% Confidence Interval)			
	NUTR only	SAN only	NUTR+SAN	CTRL
Mother's age (years)	27.7	27.5	27.7	27.8
	(27.2 - 28.1)	(27.0 - 28.0)	(27.3 - 28.1)	(27.4 - 28.1)
Buddhist (%)	98.1	97.1	96.3	98.6
	(96.6 - 99.5)	(94.5 - 99.8)	(94.0 - 98.6)	(97.3 - 99.8)
Married (%)	96.3	96.7	97.4	97.2
	(94.9 - 97.6)	(95.4 - 97.9)	(96.3 - 98.6)	(96.3 - 98.1)
Maternal Education (%)				
Never attended school	11.0	15.2	12.1	16.6
	(8.5 - 13.6)	(12.3 - 18.1)	(9.6 - 14.5)	(14.5 - 18.8)
Primary school	59.3	54.6	55.3	56.2
	(55.5 - 63.0)	(50.7 - 58.4)	(51.8 - 58.8)	(53.3 - 59.2)
Lower Secondary (7-9)	21.0	20.5	22.0	20.7
	(18.0 - 24.0)	(16.9 - 24.2)	(19.0 - 25.1)	(18.3 - 23.0)
Upper Secondary (10-12)	7.6	8.7	9.7	5.5
	(5.0 - 10.3)	(6.5 - 10.8)	(7.5 - 12.0)	(4.1 - 6.8)
Higher	1.0	1.0	0.9	1.0
	(0.2 - 1.9)	(0.3 - 1.7)	(0.3 - 1.4)	(0.4 - 1.5)
Paternal Education (%)				
Never attended school	8.8	15.2	12.4	16.5
	(6.6 - 10.9)	(11.9 - 18.5)	(10.0 - 14.9)	(14.1 - 19.0)
Primary school	51.2	49.2	48.3	52.5
	(46.9 - 55.5)	(45.7 - 52.7)	(44.7 - 51.8)	(49.5 - 55.4)
Lower Secondary (7-9)	27.3	21.8	25.1	21.4
	(23.5 - 31.1)	(18.8 - 24.8)	(22.1 - 28.2)	(19.0 - 23.9)
Upper Secondary (10-12)	9.9	11.9	11.9	8.1
	(7.1 - 12.7)	(9.0 - 14.9)	(9.6 - 14.1)	(6.3 - 9.9)
Higher	2.8	1.9	2.3	1.5
	(1.1 - 4.4)	(0.8 - 2.9)	(1.3 - 3.3)	(0.8 - 2.2)

Table 7 shows that almost all mothers across the four study groups received antenatal care during their most recent pregnancy and have had an average of two births. Current pregnancy rates are between 3.2 and 6.1 percent across the four groups, with the nutrition only and nutrition+sanitation/hygiene groups having higher pregnancy rates than the sanitation/hygiene only and control groups. The 95 percent CIs of these estimates, however, overlap across the four groups. The preceding birth interval is greater than 36 months for about 40 percent of the mothers in each group.

TABLE 7: FERTILITY AND BIRTH SPACING

Characteristic	Mean (95% Confidence Interval)			
	NUTR only	SAN only	NUTR+SAN	CTRL
Mother received antenatal care (%)	98.4	99.0	98.8	99.1
	(97.3 - 99.4)	(98.1 - 99.9)	(98.1 - 99.5)	(98.6 - 99.6)
Mother is currently pregnant (%)	6.1	3.2	5.0	4.2
	(3.3 - 8.9)	(1.6 - 4.8)	(3.2 - 6.7)	(2.8 - 5.7)
Number of Births	2.2	2.2	2.1	2.1
	(2.1 - 2.3)	(2.1 - 2.3)	(2.0 - 2.1)	(2.0 - 2.1)
Preceding birth interval (%)				
None (first birth)	38.4	42.8	42.1	45.2
	(34.2 - 42.5)	(39.0 - 46.5)	(38.7 - 45.6)	(42.3 - 48.1)
< 18 months	2.4	2.1	2.3	1.2
	(1.4 - 3.5)	(1.1 - 3.1)	(1.4 - 3.3)	(0.6 - 1.9)
18 - 23 months	4.1	3.4	4.2	3.8
	(2.7 - 5.5)	(2.1 - 4.8)	(2.9 - 5.5)	(2.8 - 4.8)
24 - 29 months	6.6	5.4	5.0	5.9
	(4.5 - 8.7)	(3.6 - 7.1)	(3.6 - 6.3)	(4.5 - 7.3)
30 - 35 months	7.0	6.7	6.1	4.5
	(5.1 - 9.0)	(4.9 - 8.5)	(4.5 - 7.7)	(3.3 - 5.7)
> 36 months	41.4	39.6	40.3	39.3
	(37.2 - 45.7)	(35.9 - 43.3)	(37.2 - 43.3)	(36.4 - 42.3)

Exposure to Any Nutrition and Sanitation/Hygiene Interventions

The baseline survey included questions to measure exposure to any nutrition and sanitation/hygiene products or activities, not specific to NOURISH and potentially beyond those provided under NOURISH. Given that NOURISH is not the only implementer in these communes providing nutrition and sanitation/hygiene interventions—such as CLTS, health home visits, CCTs, vouchers, and other community activities targeted at "first 1,000 days" families—it is important to understand the baseline exposure to any of these types of activities across the groups. Respondents may have had exposure to other programming. The questions in this module consisted of self-reported receipt or participation in these interventions. Self-reported data are subject to well-known response or recall biases, including courtesy bias (responding in ways that participants view as more pleasing to interviewers), social desirability bias (over-reporting of positive behaviors or perceptions), or acquiescence bias (bias toward answering in the affirmative). Respondents could have misremembered key aspects of their receipt or participation in these types of interventions, could have misunderstood the questions in the baseline survey, or could have forgotten past interactions with NOURISH staff and programming. Results should be interpreted in light of these limitations.

The evaluation team anticipated that some NOURISH activities had started in 12 communes, one-third of the treatment communes, by the time of the baseline survey. The Implementation Fidelity Report as of September 30, 2016 (same time as the baseline survey), however, showed that these activities are just

starting to ramp up.[12] While exposure to these nutrition and sanitation/hygiene products and activities could affect behavior, the evaluation team does not expect this to be a major threat to the integrity of the baseline because of the likely time lag between the initiation of activities and their impact on outcomes. The team also does not expect key outcomes such as stunting to have been affected by the activities in that time period.

Taking these factors into consideration, Table 8 shows that only 10.4 percent of households in the control group have received a multiple micronutrient powder, compared to 19.9 to 21.4 percent of households in the three treatment groups. The 95 percent CI for the control group estimate does not overlap across the other groups. Fewer households in the sanitation/hygiene only group report receiving therapeutic food (2.0 percent) compared to the other three groups. The 95 percent CI for the sanitation/hygiene only group is slightly below the CI for the nutrition only group, but overlaps the CI for the other two groups. Delivery of micronutrient powder, therapeutic food, and supplemental foods are not part of NOURISH nor are they connected to the Government of Cambodia's stunting prevention efforts. Home visits from a village health agent have been more prevalent in the nutrition+sanitation/hygiene group (57.4 percent). The 95 percent CI does not overlap across the other groups. Enrollment in a CCT program for health is 23.3 percent in the nutrition only group, but only between 10.1 and 15.7 percent in the other three groups. The 95 percent CI for the nutrition only estimate does not overlap across the other three groups. Given the actual CCT programs implemented in the study area, [13] responses to this question may to be reliable. It is possible that respondents were not clear on what a CCT referred to and thus the enrollment in a CCT program is likely overestimated. Across the four groups, there was a low prevalence of receipt of supplemental foods and vouchers or other forms of subsidies for water filters, latrines, and food baskets.

[12] "Implementation Fidelity Monitoring Report for the Impact Evaluation of Cambodia NOURISH", submitted December 21, 2016.

[13] Besides NOURISH, which is not implementing the CCT program in the Sanitation/Hygiene only or Control communes, there were only two small pilots by the World Bank and UNICEF in Siem Reap, but both were implemented in districts outside the NOURISH project area. KOFI supports CCT for maternal health in Battambang, but those were negotiated to be moved to other districts outside the NOURISH project area. This information was reported to the evaluation team by NOURISH staff.

TABLE 8: EXPOSURE TO NUTRITION AND SANITATION/HYGIENE INTERVENTIONS

Characteristic	Mean (95% Confidence Interval)			
	NUTR only	SAN only	NUTR+SAN	CTRL
Received in the last 12 months:				
Micronutrient powder (%)	19.9	21.1	21.4	10.4
	(16.3 - 23.5)	(18.1 - 24.0)	(18.6 - 24.1)	(9.0 - 11.8)
Therapeutic food (%)	5.0	2.0	4.3	3.7
	(3.4 - 6.6)	(0.9 - 3.1)	(3.1 - 5.6)	(2.5 - 5.0)
Supplemental food (%)	2.3	0.9	1.9	1.9
	(1.1 - 3.5)	(0.2 - 1.7)	(0.8 - 2.9)	(1.0 - 2.7)
Village health agent home visit (%)	45.2	46.4	57.4	48.4
	(41.4 - 49.0)	(42.0 - 50.7)	(52.8 - 62.0)	(45.3 - 51.5)
Enrollment in any CCT for health program (%)	23.3	12.7	15.7	10.1
	(19.1 - 27.5)	(8.8 - 16.6)	(12.7 - 18.7)	(8.1 - 12.1)
Voucher/subsidy for water filter (%)	4.0	4.7	5.0	6.5
	(1.8 - 6.3)	(3.3 - 6.1)	(3.2 - 6.8)	(4.6 - 8.5)
Voucher/subsidy for latrine construction (%)	4.8	5.9	6.2	5.8
	(2.7 - 7.0)	(4.2 - 7.7)	(4.4 - 7.9)	(4.3 - 7.3)
Voucher for food basket (%)	0.1	0.1	0.2	0.5
	(0.0 - 0.4)	(0.0 - 0.4)	(0.0 - 0.6)	(0.1 - 0.9)
Participated in the last 12 months:				
Any CLTS activity (%)	28.7	31.6	41.2	39.5
	(25.0 - 32.4)	(27.6 - 35.7)	(37.1 - 45.3)	(36.4 - 42.6)
CLTS participation led to building latrine (%)	12.5	17.7	15.2	12.3
	(8.2 - 16.8)	(12.9 - 22.5)	(11.8 - 18.6)	(9.6 - 15.1)
Any community group on first 1,000 days (%)	17.5	19.2	28.2	19.9
	(13.5 - 21.5)	(15.1 - 23.3)	(24.4 - 31.9)	(17.1 - 22.7)
Any mother/caregiver group on first 1,000 days (%)	21.8	23.2	34.6	31.6
	(18.2 - 25.4)	(19.5 - 27.0)	(30.7 - 38.6)	(28.3 - 34.8)
Aware of *Grow Together* Campaign (%)	37.6	43.4	44.7	39.6
	(32.5 - 42.6)	(38.6 - 48.1)	(40.1 - 49.4)	(35.9 - 43.3)

Table 8 also shows participation in any nutrition and sanitation village-level activities in the last 12 months. As previously stated, these do not refer specifically to NOURISH-delivered interventions, except for the Grow Together campaign, which is a NOURISH-branded campaign. The nutrition only and sanitation/hygiene only groups have been less exposed to CLTS activities than the nutrition+sanitation/hygiene and control groups. The 95 percent CIs of these estimates do not overlap across all groups. During data collection, it proved difficult to explain the meaning of CLTS to respondents, so respondents may have inaccurately reported their exposure to a CLTS activity and instead responded about any village-level sanitation activity. For those who reported participating a CLTS activity, only 12.3 to 17.7 percent report building a latrine as a result of this activity. While this is self-reported information, it gives a sense of latrine construction as a result of the CLTS activity. Latrine construction rates are important to note since measuring health effects requires achieving a reasonable change in sanitation coverage. Several sanitation trials in Indonesia, India, and Tanzania that do not show any effect on health had small changes in sanitation coverage.[14] While the baseline asks only about the

[14] Wolf Peter-Schmidt, "Seven trials, seven question marks," *The Lancet Global Health*, 3, no. 11 (2015).

toilet facility used by household members, the endline survey will include more detailed questions on latrine use and structured observation on sanitary conditions.

The nutrition+sanitation/hygiene group has been more exposed to community groups and mother/caregiver groups focusing on the first 1,000 days. The 95 percent CI for the nutrition+sanitation/hygiene group is slightly out of range of the other groups. These activities correspond to any village-level activity for pregnant women and women with young children as well as any mother support groups. Similar proportions of households, between 38 and 45 percent across the four groups, report awareness of the NOURISH *Grow Together* campaign, which airs television spots across the three provinces.

Given that assignment to the four study groups was randomized before the start of any NOURISH activities, any differences in exposures to these activities across the study groups, measured at baseline, do not pose a threat to the validity of the evaluation design.

FIGURE 4: RECEIPT OF NUTRITION OR SANITATION PRODUCTS IN LAST 12 MONTHS (%)

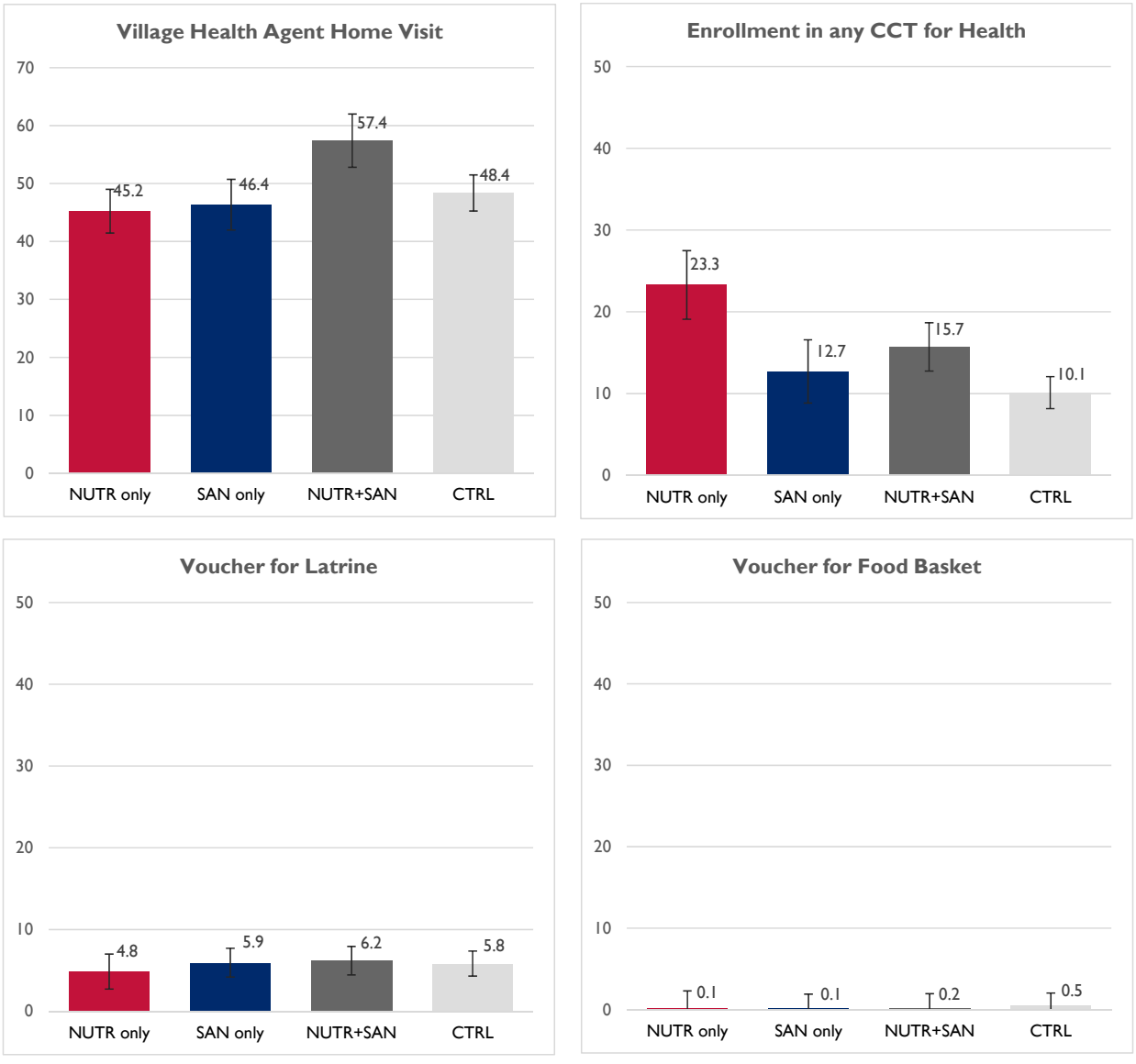
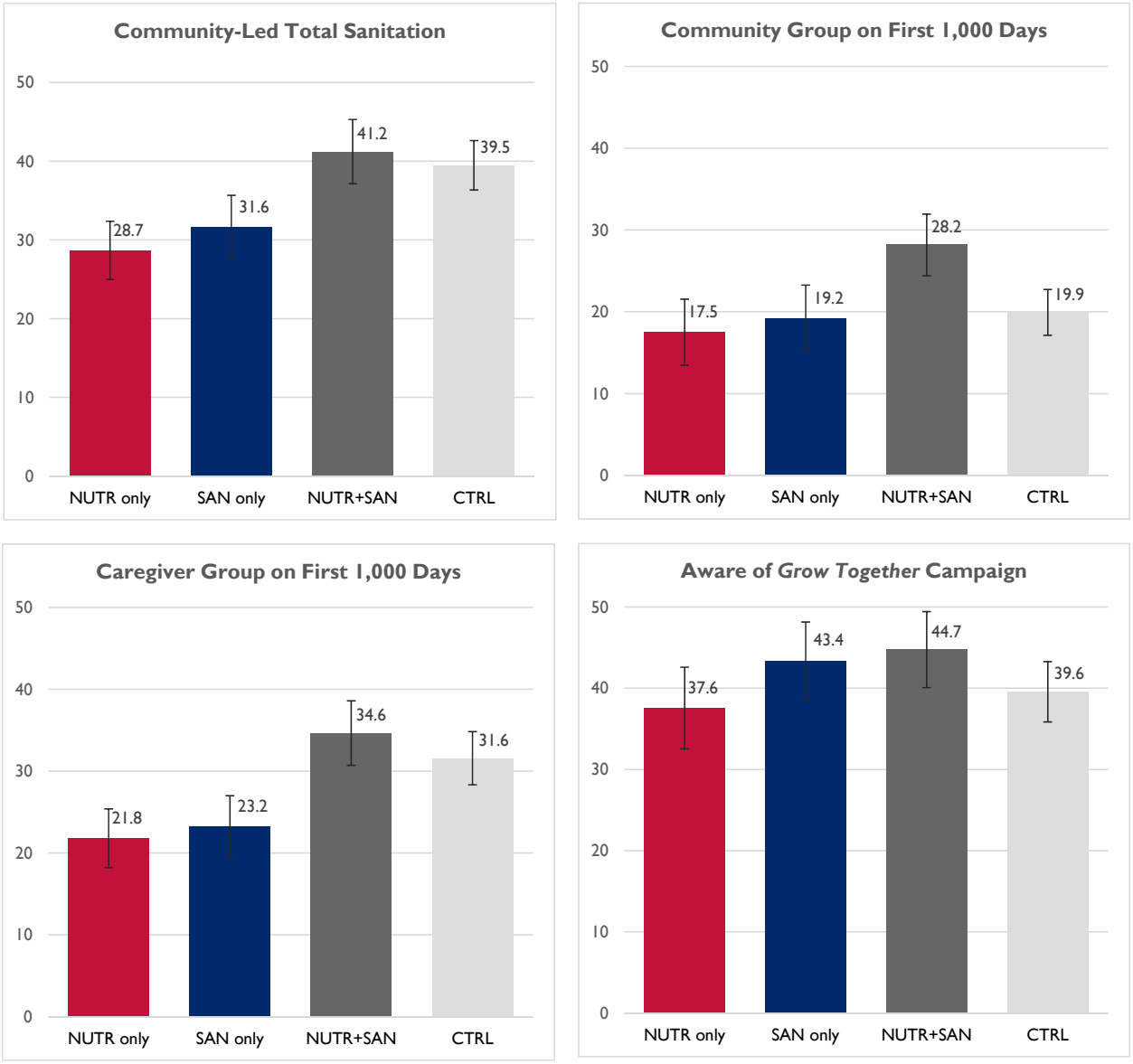


FIGURE 5: PARTICIPATION IN VILLAGE-LEVEL ACTIVITIES IN LAST 12 MONTHS (%)



Household Characteristics

Average household size in the NOURISH project area is five members, with about two children. Dwellings tend to be small and overcrowded, with an average of five members per room. These household size characteristics are similar across the four study groups, as shown in Table 9.

TABLE 9: HOUSEHOLD CHARACTERISTICS

Characteristic	Mean (95% Confidence Interval)			
	NUTR only	SAN only	NUTR+SAN	CTRL
Household size	5.6	5.5	5.2	5.4
	(5.5 - 5.8)	(5.3 - 5.6)	(5.1 - 5.3)	(5.3 - 5.5)
Number of children in HH	2.6	2.5	2.3	2.4
	(2.5 - 2.7)	(2.4 - 2.6)	(2.2 - 2.4)	(2.3 - 2.5)
Number of HH members per room	5.3	5.1	4.9	5.2
	(5.1 - 5.4)	(5.0 - 5.3)	(4.8 - 5.1)	(5.1 - 5.3)
Has IDPoor card (%)	27.9	17.6	15.1	20.9
	(24.2 - 31.6)	(14.6 - 20.5)	(12.8 - 17.4)	(18.3 - 23.5)
Wealth index score (with WASH)	0.36	0.04	-0.05	-0.18
	(0.09 - 0.63)	(-0.19 - 0.27)	(-0.22 - 0.12)	(-0.33 - -0.03)
Wealth index score (ex-WASH)	0.24	0.06	-0.04	-0.13
	(0.00 - 0.49)	(-0.15 - 0.26)	(-0.19 - 0.12)	(-0.27 - 0.01)

The evaluation team created a wealth index score using the methodology provided by the DHS.[15] The resulting wealth index is the first component score estimated from the principal component analysis of the following indicators: main source of drinking water; type of toilet facility; household assets; number of household members per room; fuel source; and roof, floor, and wall material types. It is a standardized score with a mean of 0 and a standard deviation of 1, and equals the sum of values for standardized indicators, weighted by first factor coefficient scores. The team created a second wealth index without the WASH factors to look at the association between wealth and improved sanitation coverage (see next section).

Table 9 shows that households in the nutrition only group tend to be wealthier than the other groups, particularly compared to the control group. The 95 percent CI of the nutrition only group is slightly above the CI for the control group. Paradoxically, households in the nutrition only group are also more likely to have an IDPoor card (document was observed by the enumerator). However, the baseline data suggest extreme leakage and undercoverage of the IDPoor identification system. Figure 6 shows that 21.6 percent of IDPoor cardholders are households in the top two wealth quintiles. Conversely, 34.6 percent of households in the bottom two wealth quintiles do not have an IDPoor card. Thus, the differences in having an IDPoor card become less relevant given the similar distribution of the wealth index score across the four groups, as shown in Figure 7 and Figure 8.

[15] Shea O. Rutstein, "Steps to constructing the new DHS Wealth Index", (2015).

FIGURE 6: IDPOOR CARDHOLDERS IN OVERALL SAMPLE, BY WEALTH QUINTILE

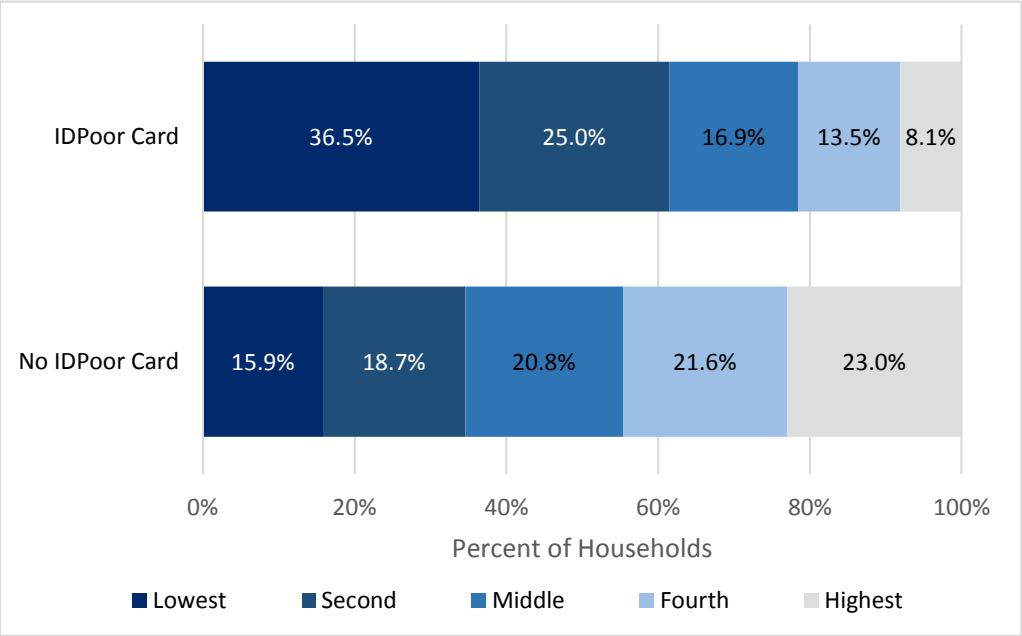


FIGURE 7: DISTRIBUTION OF HOUSEHOLD WEALTH INDEX, BY GROUP

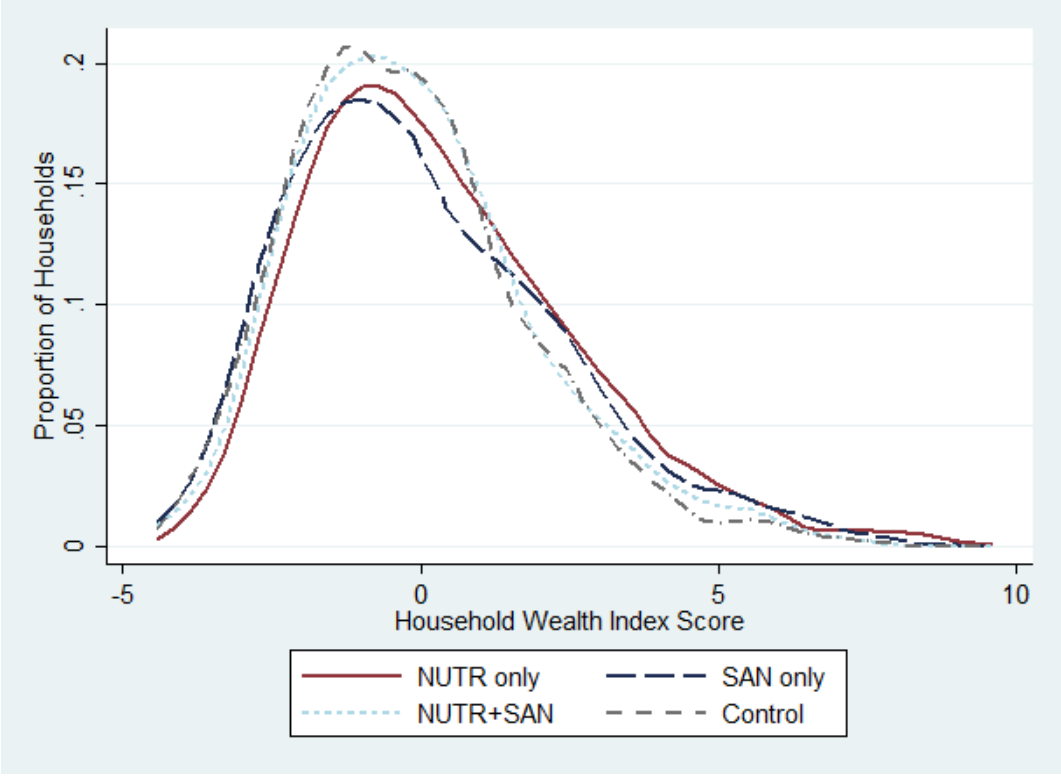
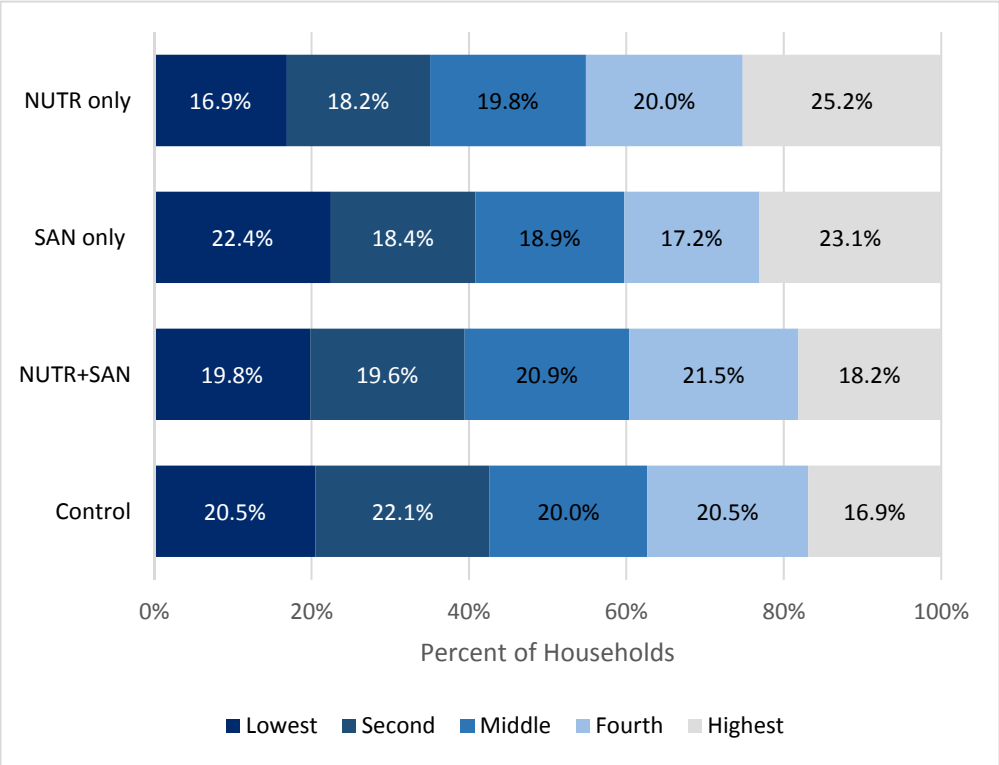


FIGURE 8: PERCENT OF HOUSEHOLDS IN EACH WEALTH QUINTILE, BY GROUP



Household WASH Conditions

Household WASH conditions are important intermediate outcomes in the causal chain toward improved child linear growth. The second development hypothesis of this evaluation states that improving WASH access, use, and practices will reduce diarrhea and enteric infections and promote gut health, leading to improved child linear growth. This section shows the baseline conditions for different WASH variables.

The baseline survey was conducted during the rainy season, which generally represents increased access to water but also increased risk of WASH-related exposures. At the time of the survey, 74.0 percent of households in the sample reported using rainwater, an improved water source, as their current main source of drinking water. During the dry season, the percent of households with an improved drinking water source would be lower due to limited rainwater availability. Tube wells or boreholes are the second most common source of drinking water (17.6 percent), followed by surface water (8.4 percent), bottled water (7.0 percent), and unprotected dug wells (6.6 percent). The current use of an improved drinking water source, as classified by the WHO/UNICEF Joint Monitoring Program (JMP) for Water Supply and Sanitation, is lower for the nutrition only and sanitation only groups, particularly when compared to the control group, as shown in Table 10. The 95 percent CIs of these two groups do not overlap with the other two groups. The drinking water ladder for each group is shown in Figure 9.

Among the 22.3 percent of the households reporting their water source to be outside their dwelling plot, the majority are within 10 minutes or less in round trip time of obtaining it. The higher average time of 14 to 24 minutes reported in Table 10 is due to outliers in the sample (less than 10 percent of households need more than 30 minutes to fetch water). While only half of the households in each study

group report always treating their water to make it safer to drink, those who do are mostly reporting using an adequate water treatment method, [16] as shown in Figure 11.

The enumerators directly observed the handwashing stations. While almost all households have a handwashing station (fixed or mobile), only 78.0 to 81.7 percent have a fixed handwashing station, and only 53.6 to 57.4 have an adequate fixed handwashing station (with available water and soap/detergent). While there are some differences across groups, the 95 percent CIs of these estimates overlap across all groups.

An improved sanitation facility, as classified by the WHO/UNICEF JMP, is a toilet facility that separates human waste from human contact and is not shared with other households. Improved sanitation facilities consist of flush or pour flush to a piped sewer system, septic tank, or pit latrine; ventilated improved pit latrines; pit latrines with a slab; and composting toilets. Unimproved sanitation facilities consist of flush or pour flush to somewhere else; pit latrines without a slab or open pits; bucket toilets; and hanging toilets. However, if this latrine is shared between two or more households, it is not considered an improved sanitation facility. Improved sanitation coverage is between 35.8 and 44.8 percent across the study groups. Open defecation prevalence is between 31.5 and 40.7 percent across the groups. Despite some differences, the 95 percent CI of these estimates overlaps across all groups. The sanitation ladder by study group is shown in Figure 9. Having an improved sanitation facility in the household varies substantially by wealth quintile (base on the wealth index without the WASH component) across the four groups. Figure 10 shows that less than a quarter of households in the bottom wealth quintile have an improved sanitation facility, while more than 80 percent of households in the top wealth quintile have one.

Between 13.2 and 20.0 percent of households use another household's latrine and between 7.9 and 10.0 percent of households share their toilet facilities with other households. Thus, a total of 22.8 to 30.0 percent of households are using a shared toilet facility. Shared toilet facilities are more common in the nutrition+sanitation/hygiene group, but the 95 percent CIs overlap across all groups. Most households (68.5 percent) that share their toilet facility are sharing it with only one other household; 96.8 percent of households that share a toilet facility do so with at most three other households.

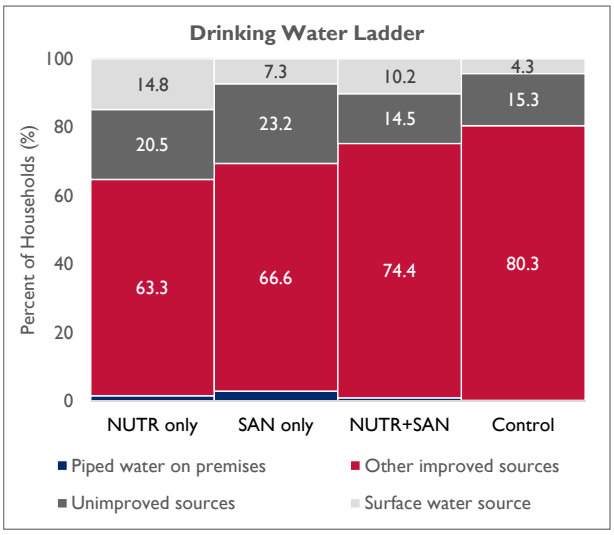
Child feces is another potential source of contamination for the household environment if it is not disposed of in a safe manner. Sanitary disposal methods consist of putting or rinsing stool into a sanitation facility or burying it, while putting or rinsing stool into a drain or ditch, throwing it into garbage or leaving it in the open are considered unsanitary.[17] Between 63.6 and 67.3 percent of households report adequately disposing of children's stool. The 95 percent CIs of these estimates overlap across all groups.

[16] Adequate water treatment is defined as boiling, adding bleach or chlorine, using water filter, solar disinfection, or buying purified water. Straining through cloth or letting it stand and settle are inadequate water treatment methods, unless used in combination with another (adequate) method. Source: World Health Organization, "Core Questions on Drinking Water and Sanitation for Household Surveys", (2006).
[17] WHO (2006).

TABLE 10: HOUSEHOLD WATER, SANITATION, AND HYGIENE CONDITIONS

Characteristic	Mean (95% Confidence Interval)			
	NUTR only	SAN only	NUTR+SAN	CTRL
Improved drinking water source (%)	64.7 (60.6 - 68.9)	69.5 (65.5 - 73.5)	75.3 (71.8 - 78.8)	80.4 (77.9 - 83.0)
Minutes to fetch water	24.0 (17.8 - 30.2)	16.3 (12.6 - 20.0)	16.5 (12.7 - 20.2)	14.1 (11.5 - 16.7)
Always treats drinking water (%)	54.1 (49.9 - 58.3)	46.6 (42.6 - 50.7)	52.8 (49.2 - 56.3)	52.1 (48.9 - 55.4)
Adequate water treatment (%)	98.1 (98.1 - 98.1)	97.8 (97.8 - 97.8)	97.4 (97.4 - 97.4)	97.1 (97.1 - 97.1)
Handwashing station observed (%)	99.7 (99.4 - 100.0)	100.0 (100.0 - 100.0)	99.7 (99.4 - 100.0)	99.9 (99.8 - 100.0)
Fixed handwashing station observed (%)	78.3 (73.3 - 83.2)	78.0 (73.8 - 82.2)	81.7 (78.4 - 85.0)	79.3 (75.8 - 82.8)
Adequate handwashing station observed (%)	55.6 (51.3 - 59.9)	53.6 (48.8 - 58.5)	57.1 (53.3 - 60.9)	57.4 (54.4 - 60.4)
Improved sanitation facility (%)	44.8 (40.0 - 49.4)	35.8 (31.6 - 40.0)	36.5 (33.3 - 39.8)	40.2 (37.1 - 43.3)
Open defecation (%)	31.5 (26.7 - 36.3)	40.7 (35.5 - 45.8)	33.0 (29.1 - 36.9)	34.3 (30.8 - 37.8)
Uses a shared toilet facility (%)	23.3 (19.9 - 26.6)	22.8 (19.1 - 26.6)	30.0 (27.1 - 33.0)	25.2 (22.4 - 27.9)
Uses another household's toilet (%)	15.3 (12.4 - 18.2)	13.2 (10.6 - 15.9)	20.0 (17.5 - 22.5)	16.7 (14.5 - 18.9)
Shares toilet facility with other HHs (%)	7.9 (5.9 - 10.0)	9.6 (7.2 - 12.0)	10.0 (8.1 - 11.9)	8.4 (6.9 - 10.0)
Number of other HHs that use toilet facility	1.5 (1.5 - 1.5)	1.5 (1.5 - 1.5)	1.6 (1.6 - 1.6)	1.4 (1.4 - 1.4)
Adequate stool disposal (%)	63.9 (59.7 - 68.1)	64.1 (59.8 - 68.4)	67.3 (64.1 - 70.5)	63.6 (60.7 - 66.4)

FIGURE 9: DRINKING WATER AND SANITATION LADDERS, BY GROUP



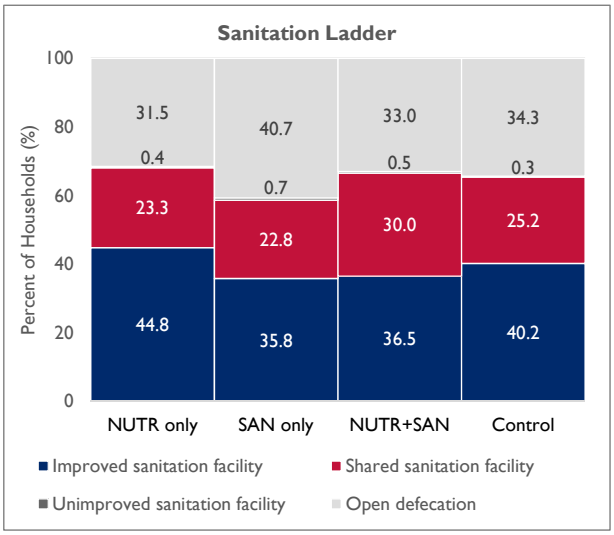
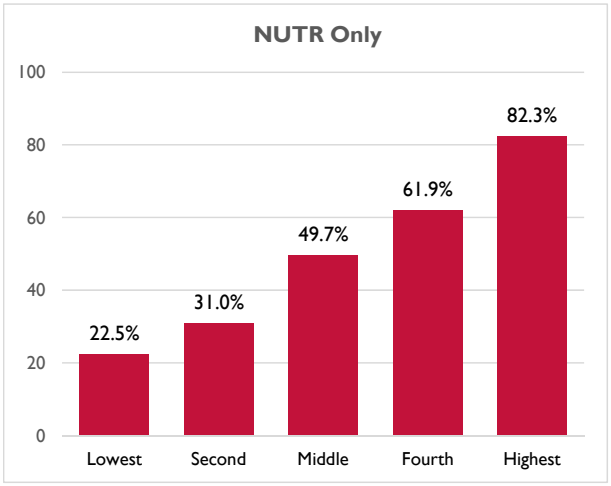
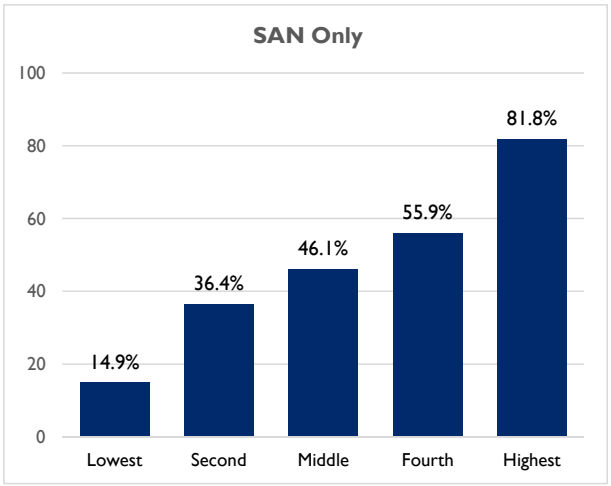
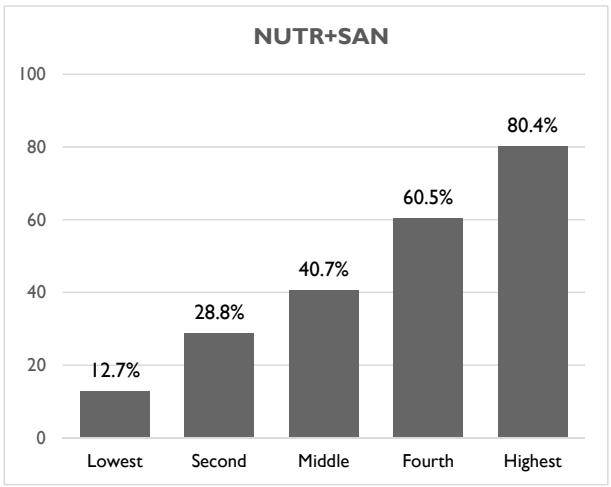


FIGURE 10: IMPROVED SANITATION COVERAGE, BY WEALTH QUINTILE (EX-WASH)







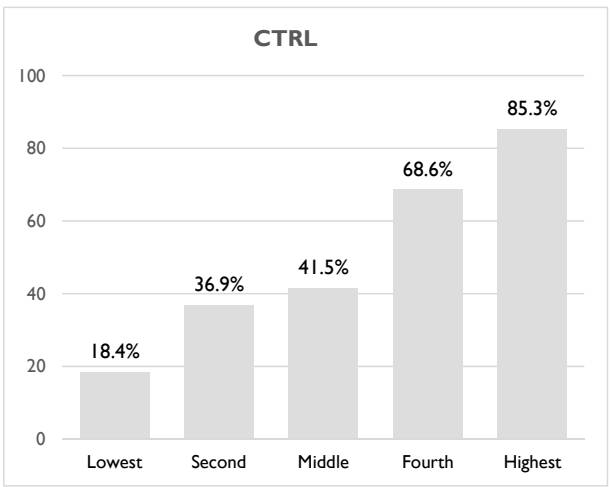
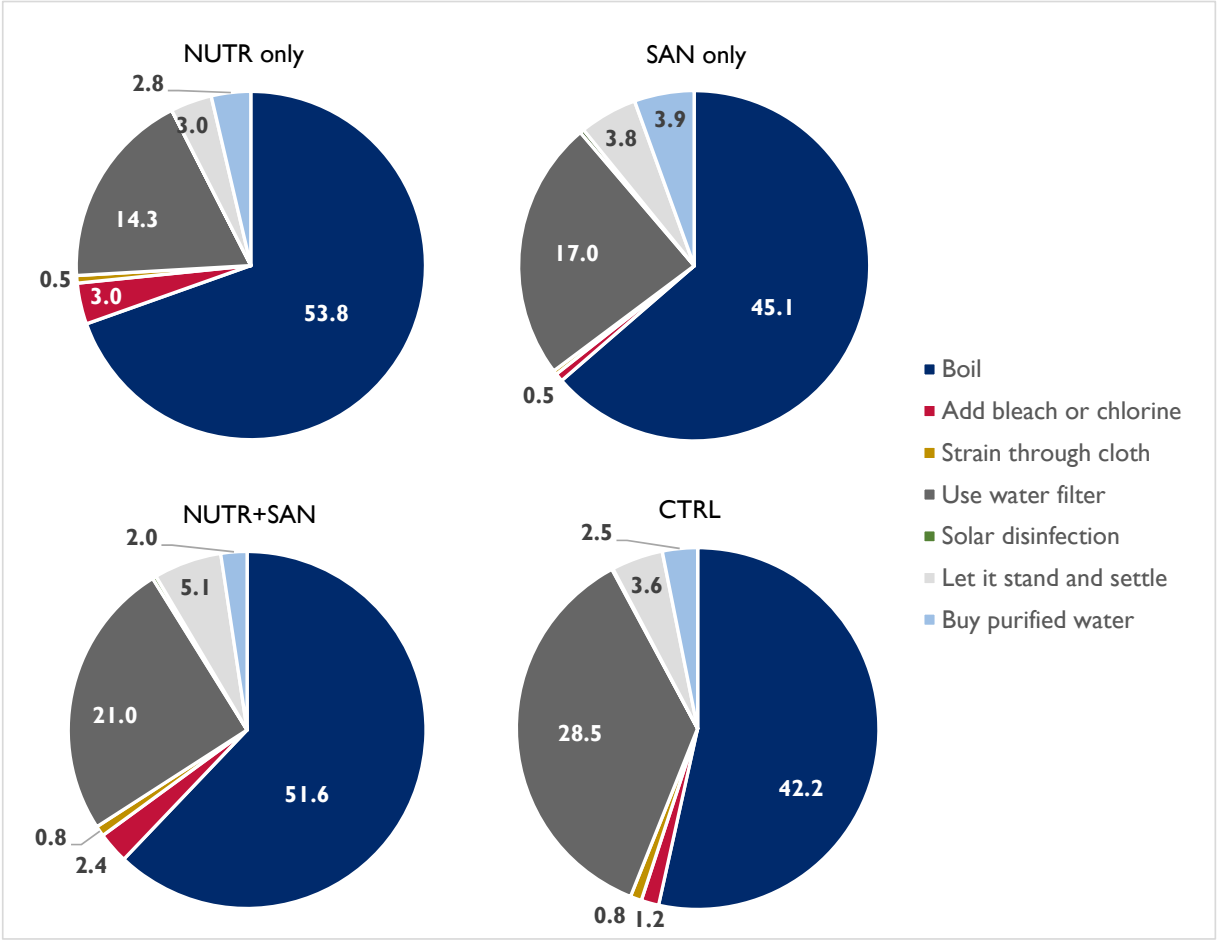


FIGURE 11: SELF-REPORTED WATER TREATMENT USED FOR DRINKING WATER, BY GROUP



Note: Adequate water treatment is defined as boiling, adding bleach or chlorine, using water filter, solar disinfection, or buying purified water. Straining through cloth or letting it stand and settle are inadequate water treatment methods, unless used in combination with another (adequate) method. Source: WHO (2006).

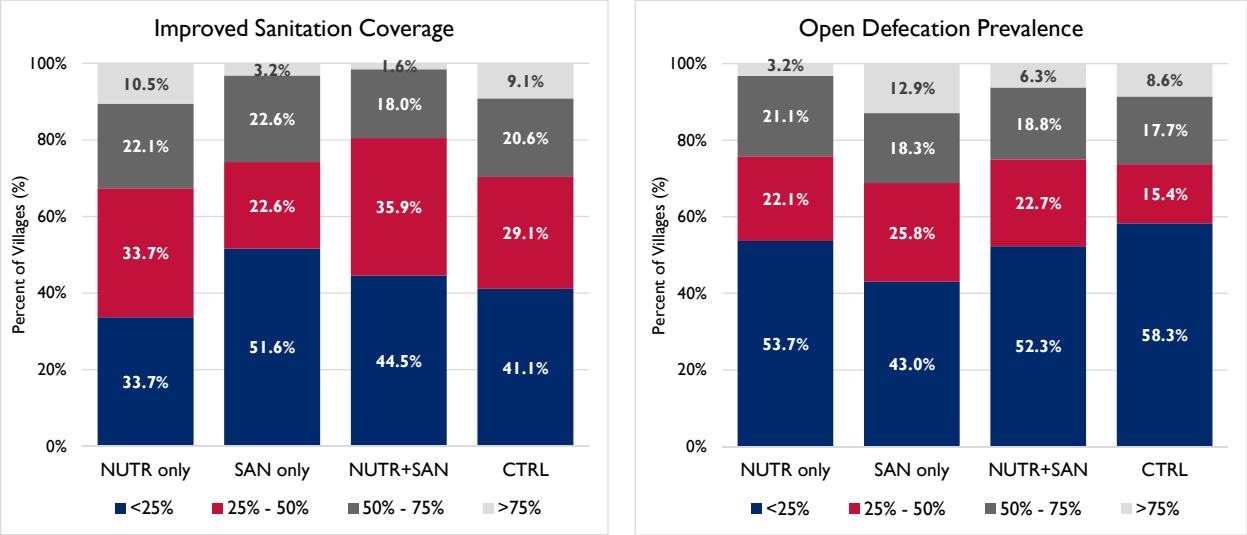
Village-Level Sanitation Coverage

The evaluation team also measured village level sanitation coverage and open defecation rates by supplementing the main sample with three additional random households in the same villages. Given the oversampling of households with children under age 2, post-stratification weights were used to get a representative sample of the population. Sampling weights calculated as follows: first, the proportion of households with children under age 2 at the village level was estimated. This estimate was then divided by the proportion of sampled households with children under age 2 at each village to yield the sampling weight for each household from the main sample. For the three additional households, the sampling weights were calculated by dividing the remaining proportion of total households at the village level by the proportion of sampled households at each village. This results in underweighting the households with children under age 2 and overweighting the supplemental households.

Figure 12 shows that about 40 percent of villages across the study groups have improved sanitation coverage rates of less than 25 percent and about 70 percent of villages across the study group have rates of less than 50 percent. Open defecation remains prevalent, about 40 percent of villages have open

defecation rates between 25 and 75 percent; but more positively, about 50 percent of villages have open defecation rates of less than 25 percent. This shows that NOURISH is implementing activities in areas that still have plenty of room for increasing latrine construction and reaching open defecation free status. The challenge, however, centers on increasing improved sanitation coverage and lowering open defecation rates in as many villages as possible across the treatment communes by a sufficient amount so that changes in primary and secondary outcomes can be detected. The evaluation team will continue to monitor the implementation fidelity of the NOURISH interventions on a quarterly basis to track the change in village sanitation coverage and will collaborate with NOURISH as implementation challenges arise.

FIGURE 12: DISTRIBUTION OF VILLAGE LEVEL SANITATION COVERAGE AND OPEN DEFECATION RATES, BY GROUP

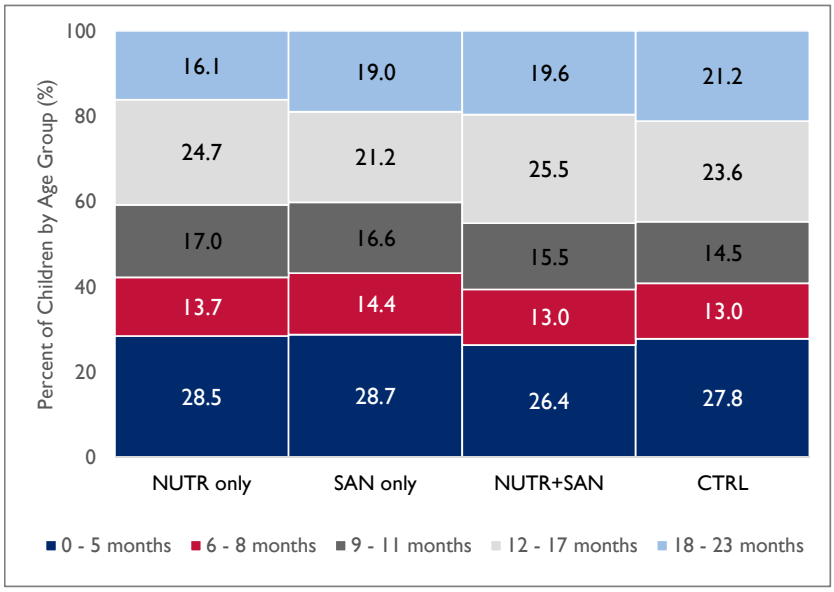


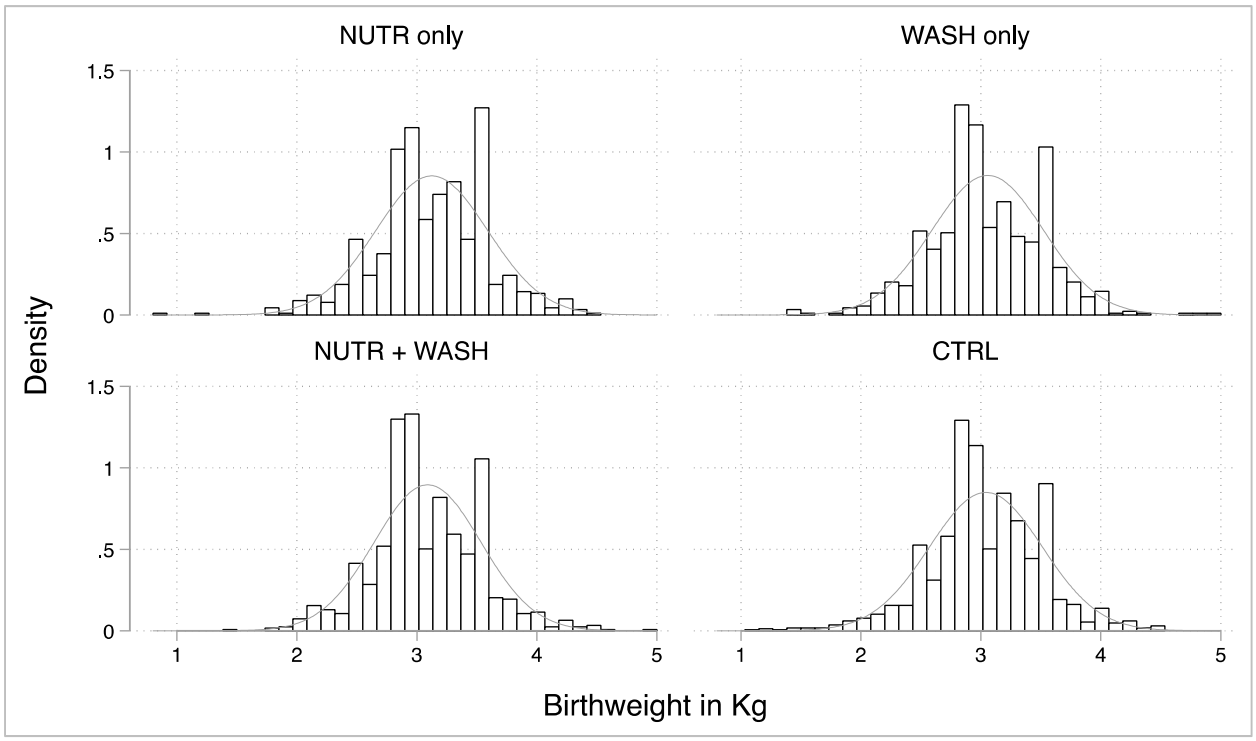
Child Characteristics

The target children for the baseline were all of the children under 24 months in each randomly selected household. While there were 4,082 eligible children in the selected households, only 4,036 children had complete and valid anthropometric data recorded.[18] All of the child-level analysis that follows is restricted to this sample of children with complete anthropometric data. Most households (95.1 percent) had only one child in this age range, but some households (4.7 percent) had two eligible children, and seven households had three children in this age range. The findings below show that young children are very similar across the four study groups; their average age is 11 months, slightly less than half (47.8 percent) of the children are girls, and the average birth weight was 3.1 kilograms. Across the four groups, the difference in birth weight between girls and boys is negligible; girls were less than 0.1 kilograms lighter than boys at birth. Between 5.9 and 7.7 percent of children are classified as having low birth weight (less than 2.5 kilograms). However, the 95 percent CIs of these estimates overlap across all groups. Birth weight was recorded from the child's birth certificate or yellow card. While 92.9 percent of the children had a birth certificate or yellow card, 23.4 percent of the documents did not have birth weight recorded, so birth weight in these cases was instead recorded based on the primary caregiver's recall.

[18] Extreme values greater than +/- 7SD were excluded (n=19).

FIGURE 13: AGE GROUP DISTRIBUTION, BY GROUP





Child Health

This section presents findings on different childhood illnesses, reported by the primary caregiver for the week or two weeks preceding the survey. Table 11 shows that across the four groups, between 7.5 and 8.4 percent of children vomited in the week before the survey. Abdominal pain in the two weeks before the survey was more prevalent, especially in the nutrition only and sanitation/hygiene only groups (20.2

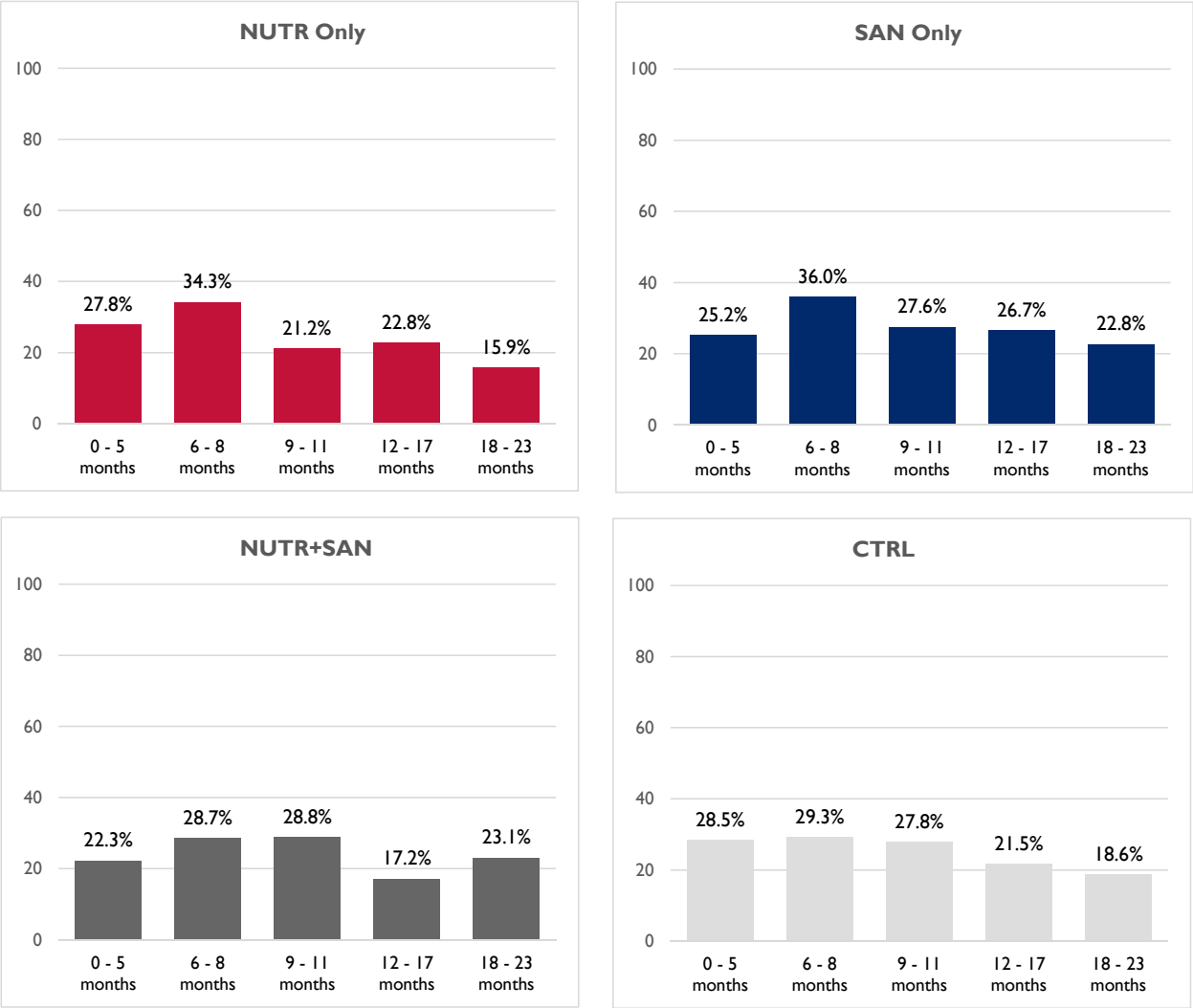
and 19.2 percent, respectively). Despite differences across groups, the 95 percent CIs of these estimates overlap across the four groups.

About one-fourth of children had diarrhea in the week preceding the survey. The occurrence of diarrhea varies by age and sex of the child. Boys are more likely to have had diarrhea in the past week than girls, and younger children, especially ages 6 to 8 months, around the point of weaning, are more prone to diarrhea than children in the older age cohorts across all study groups, as shown in Figure 15. For children across the four groups who had diarrhea in the past two weeks, between 19.6 and 21.5 percent had fever during this time, and between 1.5 and 2.2 percent had blood in their stool. Diarrhea with more than three bouts lasted between 2.4 and 2.8 days across the four groups. The 95 percent CIs of all of these estimates overlap across the four groups.

TABLE 11: CHILD HEALTH OUTCOMES

Characteristic		Mean (95% Confidence Interval)			
		NUTR only	SAN only	NUTR+SAN	CTRL
Vomit in last 7 days (%)	All	7.6 (5.8 - 9.5)	7.5 (5.5 - 9.6)	8.4 (6.8 - 10.0)	8.0 (6.5 - 9.4)
	Girls	7.1 (4.5 - 9.8)	6.9 (4.4 - 9.5)	8.0 (5.6 - 10.5)	6.9 (4.8 - 9.0)
	Boys	8.1 (5.2 - 10.9)	8.1 (5.2 - 10.9)	8.8 (6.3 - 11.2)	8.9 (6.8 - 11.0)
Abdominal pain in last 2 weeks (%)	All	20.2 (17.1 - 23.3)	19.2 (16.1 - 22.4)	17.0 (14.5 - 19.5)	16.8 (14.7 - 19.0)
	Girls	20.6 (16.2 - 25.1)	18.6 (14.3 - 22.9)	15.9 (12.3 - 19.4)	15.0 (12.2 - 17.9)
	Boys	19.8 (15.6 - 24.0)	19.8 (15.2 - 24.4)	18.1 (14.5 - 21.6)	18.5 (15.5 - 21.5)
Diarrhea in last 7 days (%)	All	24.4 (21.2 - 27.6)	27.2 (23.6 - 30.8)	22.9 (20.3 - 25.6)	24.7 (22.3 - 27.1)
	Girls	21.7 (17.1 - 26.3)	25.8 (21.4 - 30.3)	21.3 (17.8 - 24.8)	23.3 (19.8 - 26.7)
	Boys	26.9 (22.3 - 31.5)	28.4 (23.0 - 33.7)	24.5 (20.7 - 28.2)	26.1 (22.9 - 29.2)
Diarrhea in last 2 weeks (%)	All	32.7 (29.2 - 36.2)	36.4 (32.7 - 40.2)	29.2 (26.4 - 32.0)	31.5 (29.1 - 33.9)
	Girls	31.0 (25.9 - 36.0)	33.9 (28.7 - 39.1)	27.8 (23.9 - 31.7)	29.5 (25.8 - 33.2)
	Boys	34.2 (29.3 - 39.2)	38.6 (33.3 - 44.0)	30.5 (26.4 - 34.5)	33.4 (30.1 - 36.6)
Had fever during diarrheal episode (%)	All	19.6 (16.8 - 22.4)	21.5 (18.2 - 24.7)	17.6 (15.2 - 20.0)	19.8 (17.6 - 22.0)
	Girls	19.8 (15.5 - 24.2)	19.2 (14.8 - 23.5)	16.8 (13.2 - 20.4)	18.1 (15.0 - 21.2)
	Boys	19.3 (16.0 - 22.7)	23.5 (18.4 - 28.5)	18.2 (14.9 - 21.6)	21.4 (18.5 - 24.3)
Had blood in stools during diarrheal episode (%)	All	1.9 (1.0 - 2.8)	1.8 (0.9 - 2.8)	2.2 (1.2 - 3.1)	1.5 (0.8 - 2.1)
	Girls	2.1 (0.7 - 3.5)	1.9 (0.5 - 3.4)	2.0 (0.8 - 3.1)	1.2 (0.4 - 2.0)
	Boys	1.7 (0.5 - 3.0)	1.7 (0.5 - 2.9)	2.4 (1.0 - 3.8)	1.7 (0.8 - 2.7)
Number of days with 3 or more bouts of diarrhea	All	2.45 (2.2 - 2.7)	2.58 (2.3 - 2.8)	2.54 (2.3 - 2.8)	2.78 (2.5 - 3.0)
	Girls	2.40 (2.1 - 2.8)	2.63 (2.2 - 3.0)	2.39 (2.1 - 2.7)	2.61 (2.3 - 2.9)
	Boys	2.47 (2.2 - 2.8)	2.54 (2.3 - 2.8)	2.66 (2.4 - 3.0)	2.91 (2.6 - 3.2)

FIGURE 15: DIARRHEA INCIDENCE IN PREVIOUS WEEK, BY AGE GROUP



Child Nutrition

The baseline survey also collected data about the youngest (6 – 24 months old) child's dietary intake in the previous 24 hours, including questions on breastfeeding, introduction of solids and semi-solid foods, meal frequency, and consumption of a variety of liquids (formula, milk, juice, soup, and borbor) and solids (eggs, organ meat, green leafy vegetables, frogs/snails/crabs/insects, small rice fish, beans, nuts, dark green leafy vegetables, yellow or orange fruits, dried fish, dairy, sweets, and packaged snacks). Based on these questions and WHO infant and young child feeding guidelines,[19] the evaluation team constructed a variety of indicators, including: a dietary diversity score, minimum dietary diversity, minimum meal frequency, and minimum acceptable diet. These indicators emerge from the evidence-based concept that a child has a higher probability of meeting his/her recommended nutrient intakes if the meal frequency and dietary diversity are higher.

Table 12 shows that breastfeeding is nearly universal in the NOURISH study area, with 97.6 to 98.6 percent of children born in the last two years having been breastfed at some point in time. However,

[19] World Health Organization, "Indicators for assessing infant and young child feeding practices: Measurement", (2010).

current breastfeeding rates vary substantially by age group. A significant drop in breastfeeding rates happens after the first year (to between 66.5 and 74.1 percent), and only 25.8 to 35.9 percent of children continue to breastfeed until age 2, as shown in Figure 16.

While the survey did not ask questions to determine exclusive breastfeeding, it did collect information on the introduction of complementary foods. Between 86.1 and 91.2 percent of children ages 6 – 8 months, across the four study groups, are introduced to solid and semi-solid complementary foods at the appropriate time. The 95 percent CIs of these estimates overlap across the four groups. Also, more than half of children (51.6 to 58.4 percent) meet the recommended minimum meal frequency;[20] however, the difference between the sanitation/hygiene only group and the nutrition+sanitation/hygiene group extends slightly beyond the 95 percent CI.

The dietary diversity score consists of discretizing solid foods into seven food groups, which include: grains, legumes/nuts, dairy, flesh meat, eggs, vitamin A rich fruits and vegetables, and other fruits and vegetables. To tailor the score to the Cambodian context, the evaluation team asked additional questions on the types of fish and other wild animals consumed, which are included in the flesh meat group. The average dietary diversity score (0 – 7 scale) for the previous day was 2.2 to 2.4 food groups, and this was consistent across the study groups. Figure 17 shows that most of the dietary diversity score is driven by the consumption of grains, flesh meat, and vitamin A rich produce, with very little consumption of dairy and eggs. Between 29.6 and 35.1 percent of children have minimum dietary diversity, defined as having received food from four or more food groups. Between 23.7 and 29.8 percent of children have a minimum acceptable diet, which means their feeding practices met minimum standards with respect to food diversity as well as feeding frequency. Despite differences across groups, the 95 percent CI of these estimates overlaps across the four groups.

[20] The minimum number of times breastfed children should receive solid, semi-solid, or soft foods varies with age (2 times if 6–8 months and 3 times if 9–23 months). The minimum number of times non-breastfed children should receive solid, semi-solid, or soft foods, including milk, is 4 times for all children 6–23 months (does not vary by age).

TABLE 12: CHILD NUTRITIONTAL STATUS

Characteristic		Mean (95% Confidence Interval)			
		NUTR only	SAN only	NUTR+SAN	CTRL
Ever breastfed (%)	All	97.6 (96.3 - 98.8)	98.6 (97.6 - 99.5)	98.5 (97.8 - 99.2)	97.6 (96.8 - 98.5)
	Girls	97.1 (95.1 - 99.1)	98.3 (97.0 - 99.6)	98.8 (97.9 - 99.8)	97.0 (95.4 - 98.5)
	Boys	98.0 (96.6 - 99.4)	98.8 (97.5 - 100.1)	98.2 (97.1 - 99.3)	98.3 (97.4 - 99.2)
Currently breastfed (%)	All	76.2 (72.7 - 79.6)	76.9 (73.8 - 80.0)	77.4 (74.9 - 79.8)	76.8 (74.6 - 79.1)
	Girls	74.4 (69.8 - 79.0)	74.6 (69.8 - 79.3)	77.0 (73.4 - 80.7)	75.7 (72.3 - 79.1)
	Boys	77.8 (72.8 - 82.8)	79.0 (75.3 - 82.6)	77.7 (74.1 - 81.3)	77.8 (74.8 - 80.8)
Solid and semi-solid foods introduced for children 6 - 8 months (%)	All	91.2 (85.6 - 96.7)	86.1 (79.5 - 92.7)	87.6 (82.0 - 93.1)	89.1 (84.4 - 93.7)
	Girls	93.8 (86.8 - 100.7)	89.1 (80.0 - 98.3)	83.9 (74.6 - 93.1)	87.3 (79.9 - 94.8)
	Boys	88.9 (80.4 - 97.4)	83.9 (74.6 - 93.1)	90.7 (84.0 - 97.3)	90.5 (84.6 - 96.5)
Dietary Diversity Score	All	2.19 (2.0 - 2.3)	2.27 (2.1 - 2.4)	2.34 (2.2 - 2.5)	2.42 (2.3 - 2.5)
	Girls	2.32 (2.1 - 2.5)	2.29 (2.1 - 2.5)	2.40 (2.2 - 2.6)	2.43 (2.3 - 2.6)
	Boys	2.06 (1.9 - 2.3)	2.25 (2.1 - 2.4)	2.28 (2.1 - 2.4)	2.41 (2.3 - 2.6)
Minimum Dietary Diversity (%)	All	29.6 (25.8 - 33.4)	32.4 (28.6 - 36.2)	32.8 (29.7 - 35.9)	35.1 (32.0 - 38.2)
	Girls	32.3 (27.2 - 37.3)	33.6 (28.6 - 38.6)	34.4 (29.7 - 39.1)	35.5 (31.5 - 39.6)
	Boys	27.1 (22.1 - 32.2)	31.3 (26.9 - 35.7)	31.2 (27.3 - 35.1)	34.7 (31.0 - 38.5)
Minimum Meal Frequency (%)	All	52.9 (49.2 - 56.5)	51.6 (48.3 - 55.0)	58.4 (55.1 - 61.6)	55.5 (52.5 - 58.4)
	Girls	54.5 (49.6 - 59.4)	52.8 (47.8 - 57.8)	56.8 (51.8 - 61.7)	55.3 (51.1 - 59.6)
	Boys	51.3 (45.9 - 56.8)	50.6 (45.6 - 55.6)	59.9 (55.9 - 63.8)	55.6 (51.9 - 59.3)
Minimum Acceptable Diet (%)	All	22.9 (19.8 - 26.0)	25.2 (21.9 - 28.6)	27.6 (24.6 - 30.6)	28.9 (26.0 - 31.7)
	Girls	25.1 (21.1 - 29.2)	27.2 (22.5 - 32.0)	28.0 (23.6 - 32.4)	29.2 (25.3 - 33.1)
	Boys	20.8 (16.4 - 25.2)	23.5 (19.5 - 27.4)	27.2 (23.3 - 31.1)	28.6 (25.2 - 32.0)

FIGURE 16: CURRENT BREASTFEEDING, BY AGE GROUP

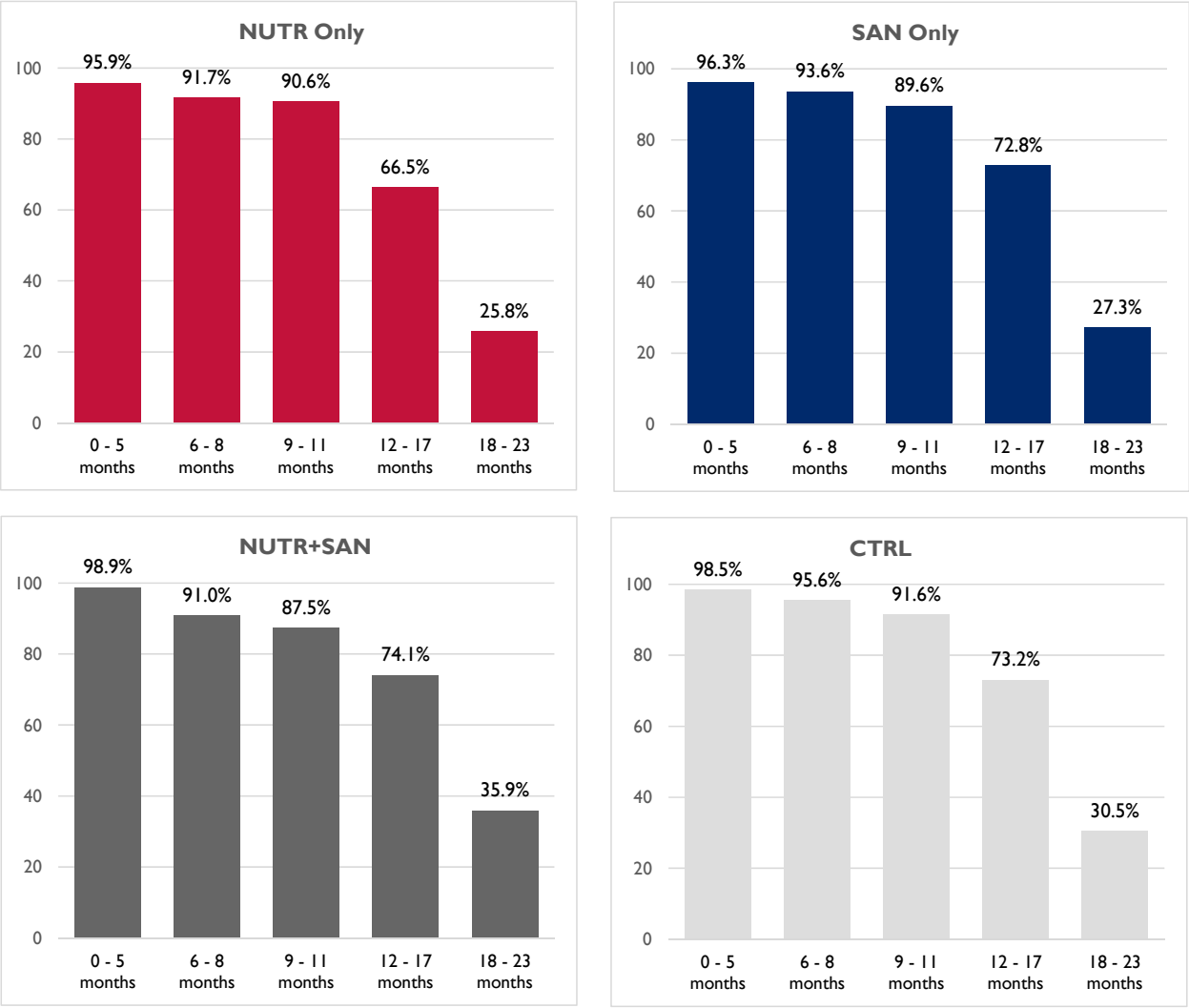
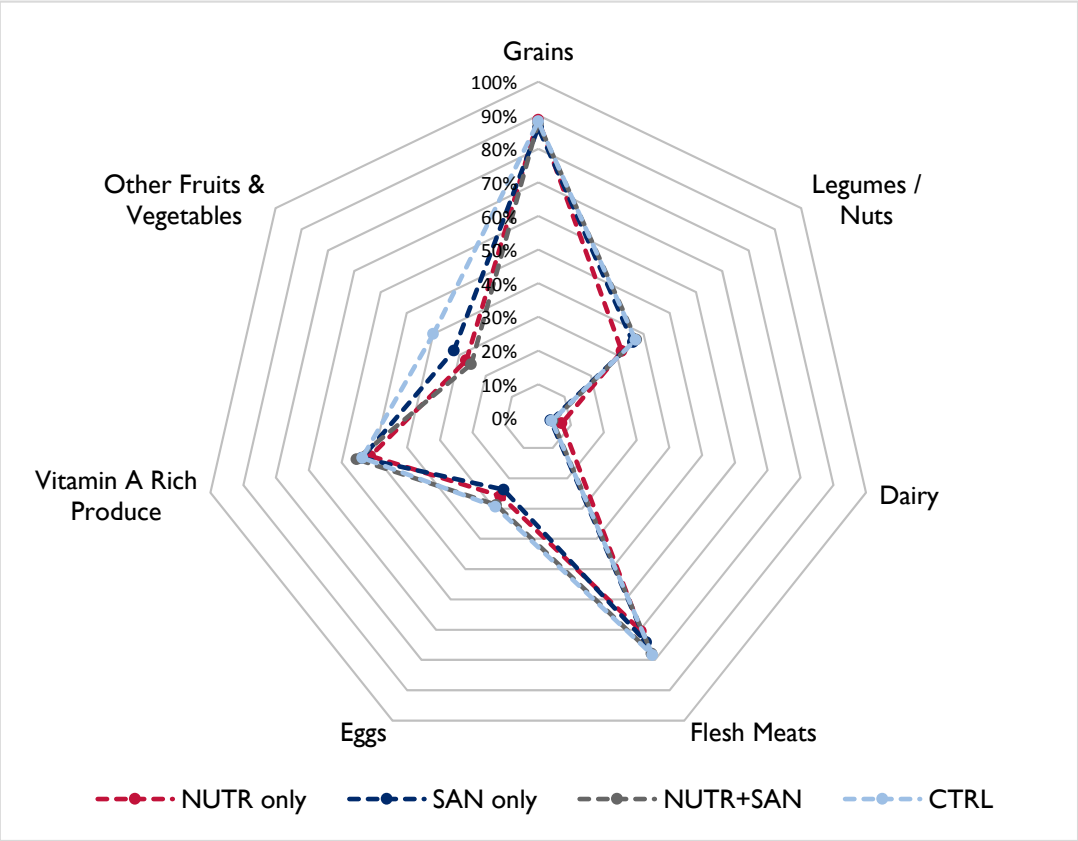


FIGURE 17: DIMENSIONS OF DIETARY DIVERSITY, BY GROUP



Child Anthropometric Measures

In addition to questions about dietary intake, the baseline survey included an anthropometric component in which the children under age 2 were measured for height and weight. This module corresponds to the primary outcomes of the impact evaluation. Weight and height measurements were taken following FANTA guidelines;[21] see Annex E for details on the anthropometry protocols.

The average HAZ score for children under 2 in the study area is -0.96 SD below the mean of the WHO reference population. Children in the sanitation/hygiene only group have lower HAZ scores relative to the nutrition only group; the 95 percent CIs do not overlap for these two groups. Overall, 16.3 percent of children under age 2 are stunted. While more children in the sanitation/hygiene only group are stunted relative to the nutrition only group, 18.7 percent compared to 13.7 percent respectively; the 95 percent CIs overlap for these two groups. Analysis by age group shows that stunting is apparent even among children 0 – 6 months old (8.0 percent). In general, stunting increases with the age of the child, rising from 12.8 percent among children 6 – 8 months old to 28.8 percent among children 18 – 23 months old. Also, boys (18.3 percent) are more likely to be stunted than girls (14.5 percent). The prevalence of stunting is also higher among children living in the poorest households (21.6 percent) than among children in the richest households (10.6 percent). These same patterns are observed across the study groups.

[21] Bruce Cogill, "Anthropometric Indicators Measurement Guide," (2003).

The average WHZ score for the study area is -0.61 SD below the mean of the WHO reference population. The 95 percent CIs overlap across the study groups. Overall, 8.1 percent of children under age 2 are wasted. The prevalence of wasting is between 7.9 and 8.6 percent across the study groups. The 95 percent CIs of these estimates overlap across the four groups. Wasting prevalence patterns are inconsistent by age of the child and by wealth quintiles. Boys (10.5 percent) are more likely to be wasted than girls (5.6 percent). This pattern by sex of the child is observed across the study groups.

TABLE 13: CHILD ANTHROPOMETRIC MEASURES

Characteristic		Mean (95% Confidence Interval)			
		NUTR only	SAN only	NUTR+SAN	CTRL
HAZ score	All	-0.84 (-0.93 - -0.75)	-1.07 (-1.15 - -1.00)	-0.94 (-1.01 - -0.87)	-0.99 (-1.05 - -0.93)
	Girls	-0.84 (-0.96 - -0.71)	-0.93 (-1.04 - -0.81)	-0.83 (-0.93 - -0.74)	-0.95 (-1.04 - -0.87)
	Boys	-0.84 (-0.97 - -0.71)	-1.20 (-1.30 - -1.10)	-1.04 (-1.13 - -0.94)	-1.02 (-1.10 - -0.94)
WAZ score	All	-0.90 (-0.98 - -0.81)	-1.02 (-1.08 - -0.95)	-0.97 (-1.03 - -0.91)	-1.02 (-1.07 - -0.97)
	Girls	-0.86 (-0.97 - -0.76)	-0.90 (-0.99 - -0.81)	-0.83 (-0.92 - -0.74)	-0.98 (-1.05 - -0.91)
	Boys	-0.92 (-1.05 - -0.80)	-1.12 (-1.22 - -1.01)	-1.10 (-1.19 - -1.02)	-1.06 (-1.14 - -0.99)
WHZ score	All	-0.58 (-0.67 - -0.49)	-0.55 (-0.64 - -0.47)	-0.63 (-0.70 - -0.57)	-0.65 (-0.71 - -0.59)
	Girls	-0.54 (-0.65 - -0.43)	-0.52 (-0.61 - -0.43)	-0.54 (-0.63 - -0.45)	-0.60 (-0.67 - -0.53)
	Boys	-0.62 (-0.75 - -0.49)	-0.58 (-0.72 - -0.44)	-0.72 (-0.82 - -0.62)	-0.70 (-0.78 - -0.61)
Stunted (%)	All	13.7 (11.4 - 16.1)	18.7 (15.9 - 21.6)	16.1 (13.8 - 18.5)	17.0 (15.1 - 19.0)
	Girls	12.7 (9.4 - 16.0)	15.0 (10.9 - 19.1)	14.1 (11.0 - 17.2)	15.5 (12.9 - 18.0)
	Boys	14.7 (10.9 - 18.5)	22.0 (18.0 - 26.0)	18.1 (15.0 - 21.1)	18.5 (15.7 - 21.3)
Wasted (%)	All	8.0 (6.1 - 9.9)	7.9 (5.7 - 10.2)	8.6 (7.0 - 10.2)	8.0 (6.8 - 9.3)
	Girls	6.3 (4.0 - 8.7)	3.9 (1.9 - 5.9)	5.3 (3.5 - 7.1)	6.2 (4.6 - 7.8)
	Boys	9.5 (6.5 - 12.6)	11.5 (8.0 - 15.0)	11.7 (8.9 - 14.5)	9.7 (7.6 - 11.8)

FIGURE 18: HEIGHT-FOR-AGE Z-SCORE, BY GROUP

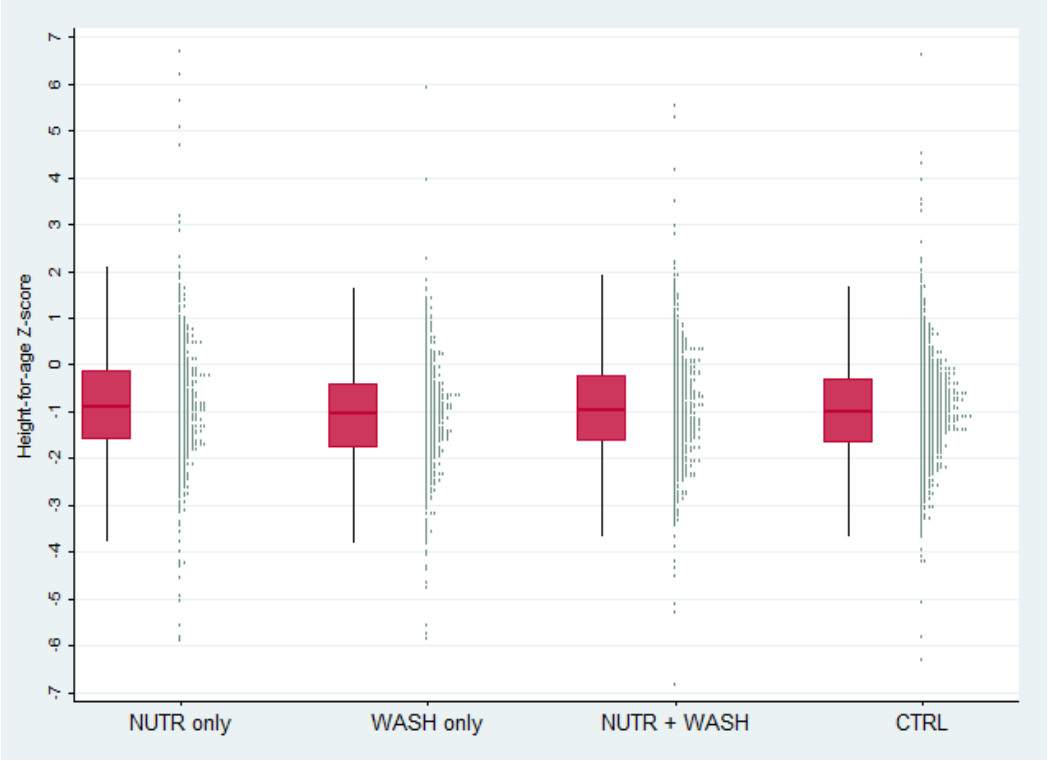


FIGURE 19: WEIGHT-FOR-AGE Z-SCORE, BY GROUP

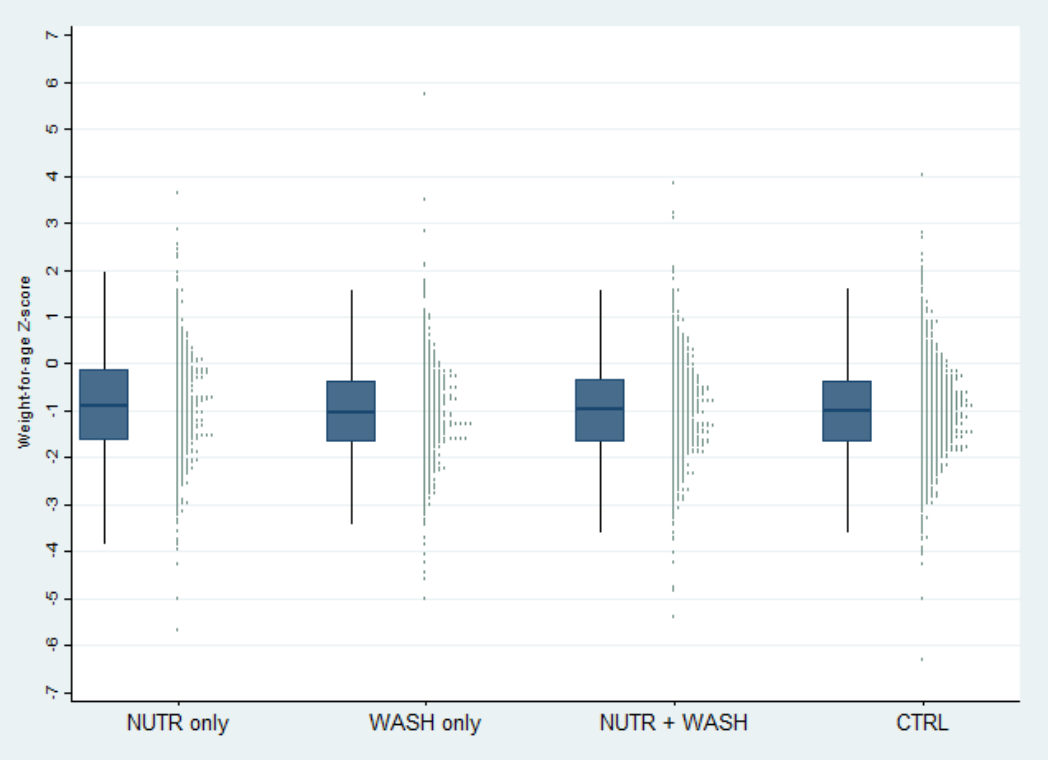


FIGURE 20: WEIGHT-FOR-HEIGHT Z-SCORE, BY GROUP

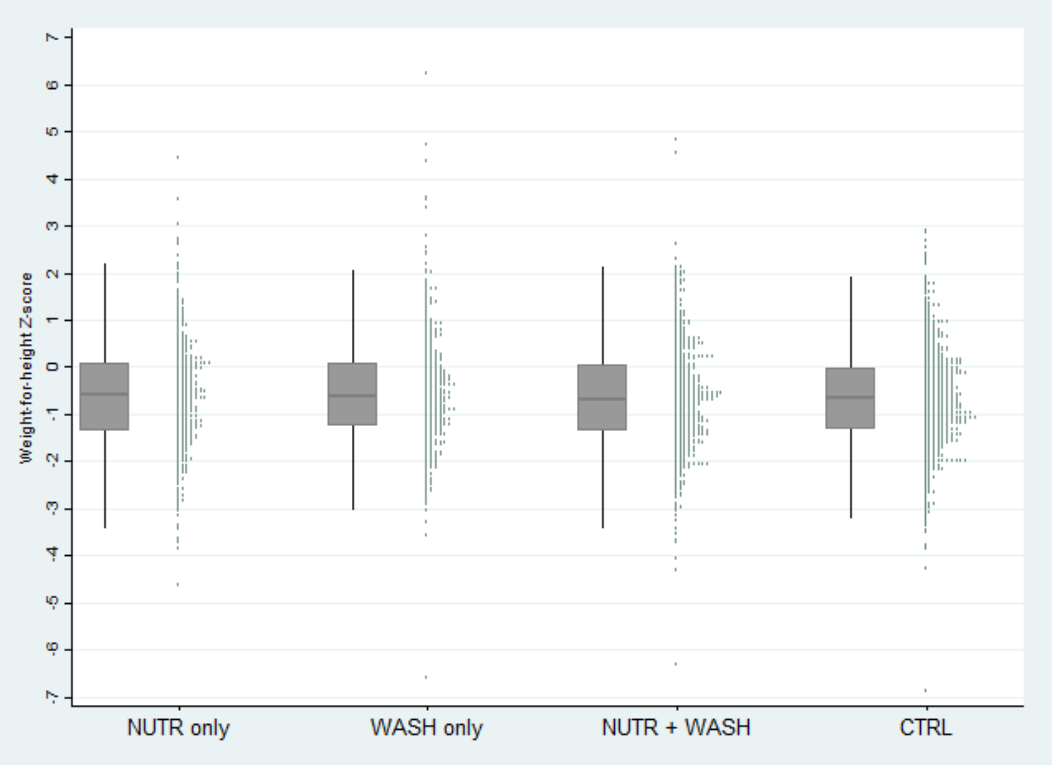
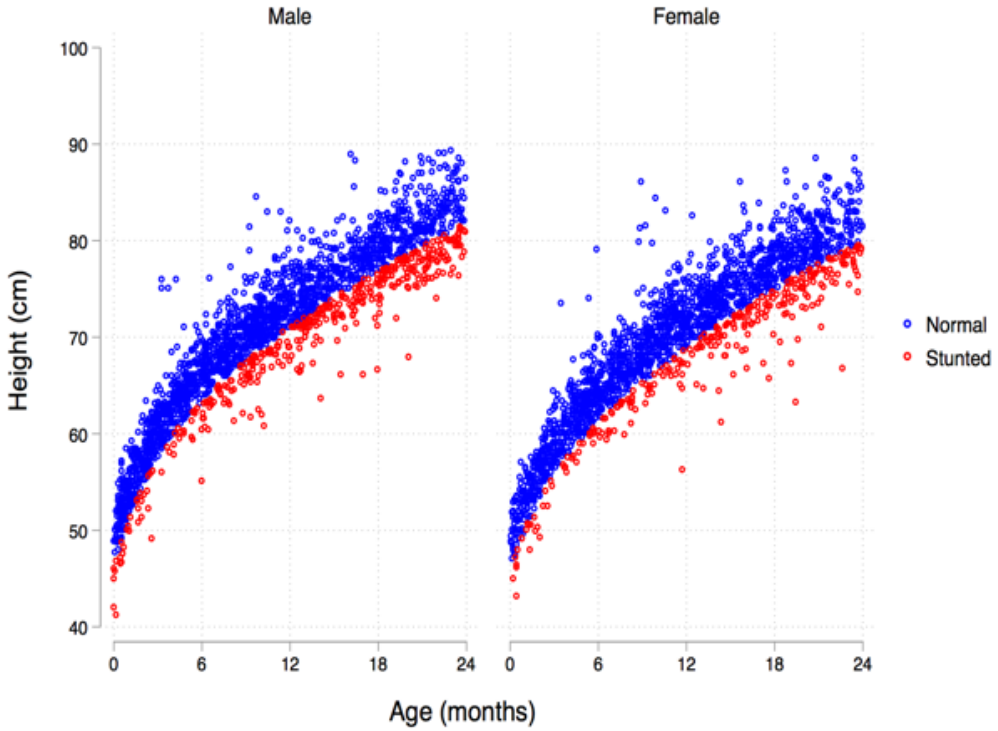


FIGURE 21: HEIGHT-FOR-AGE GROWTH CURVE (STUNTED AT -2SD), BY SEX



VARIABLES ASSOCIATED WITH CHILD STUNTING

This section examines the association between stunting in children and various socioeconomic characteristics and public health determinants. The evaluation team used a multivariate hierarchical logistic regression to model stunting (a binary variable) and a multivariate linear regression to model HAZ (a continuous variable) as functions of children's socioeconomic characteristics.[22]

The choice of variables to include in this analysis stems from existing evidence[23] and the conceptual framework of how WASH conditions and dietary intake affect child nutritional status.[24] The analysis included the following child-level covariates: child's sex, child's age in months, birth weight, currently breastfed, diarrhea episode in the week preceding the survey, minimum dietary diversity, and minimum meal frequency. It included the following household-level covariates: mother's age, maternal and paternal education levels, number of household members, household wealth index score (ex-WASH), access to improved water source, access to improved sanitation facility, and adequate disposal of child's stool. The team also included village-level open defecation rates given recent evidence of community-wide sanitation effects on child growth.[25]

It is important to note that this analysis does not address causal effect since it is based on data from a cross-sectional survey, so any associations are merely suggestive and not conclusive. Also, a few relevant variables, such as exclusive breastfeeding and maternal height and body mass index, were not included in the model because they were not measured in the baseline. Despite these missing variables, the model accounts for a large number of evidence-based covariates.

Holding these factors constant, child stunting shows a statistically significant association with the child's sex and age, birth weight, episode of diarrhea in the week before the survey, paternal education, and household wealth (Column 1 in Table 14). The odds of stunting for boys are 53 percent higher than the odds for girls. There is a 10 percent increase in the odds of stunting for a 1-month increase in age. There is also a 79 percent decrease in the odds of stunting for each 1-kilogram increase in birth weight. This translates to a 15 percent decrease in the odds of stunting for each 100-gram increase in birth weight. Also, the odds of stunting are 21 percent higher for children who experienced a diarrhea episode the week before the survey. Having a father with at least primary education is associated with a 22 percent decrease in the odds of stunting. Finally, a 1-point increase in the household wealth index score is associated with an 8 percent decrease in the odds of stunting. Surprisingly, neither dietary intake nor access to an improved sanitation facility were associated with decreased odds of stunting.

With respect to the continuous HAZ score, most of the statistically significant variables are the same as for stunting, with a few noted additions, including current breastfeeding, number of household members, and improved sanitation facility (Column 2 in Table 15). Current breastfeeding is associated with a 0.13 SD decrease in HAZ scores. While it may be initially surprising to see breastfeeding negatively correlated with HAZ, empirical evidence suggests that mothers breastfeed longer if the child is smaller and wean early if the child is physically large.[26] Since this is a cross-sectional analysis, it may be depicting an instance of this reverse causality. A 1-person increase in the number of household members is

[22] Nayu Ikeda, Yuki Irie, and Kenji Shibuya, "Determinants of reduced child stunting in Cambodia: analysis of pooled data from three Demographic and Health Surveys," *Bulletin of the World Health Organization*, 91, no. 5 (2013).
[23] Ikeda et al (2013); Cumming and Cairncross (2016).
[24] Alan D. Dangour et al, "Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutritional status of children," *Cochrane Database of Systematic Reviews*, Issue 8 (2011).
[25] James A. Fuller et al, "I get height with a little help from my friends: herd protection from sanitation on child growth in rural Ecuador," *International Journal of Epidemiology*, 45, no. 2 (2016).
[26] Grace S. Marquis et al, "Association of breastfeeding and stunting in Peruvian toddlers: an example of reverse causality," *International Journal of Epidemiology*, 26, no. 2 (1997).

associated with a 0.02 SD decrease in HAZ. This is expected since households with more people tend to be more crowded, given that most of the households in the study area only have 1 or 2 rooms. Having an improved sanitation facility is associated with a 0.08 SD increase in HAZ. Improved sanitation facilities may prevent young children from coming into contact with feces and hence reduce the risk of infections transmitted by the fecal-oral route.

When analyzing the association between diarrhea and improved WASH conditions, neither an improved drinking water source nor improved sanitation facility were associated with diarrhea. However, self-reported adequate disposal of children's feces shows a statistically significant relationship (Table 15). Adequate disposal of stool is associated with a 26 percent reduction in the odds of having diarrhea. Many households do not properly dispose of young children's stool and simply leave it in the open, increasing the odds of diarrhea from the ingestion of pathogens from these feces.

Nonetheless, it is not surprising that while diarrhea and improved sanitation coverage are separately associated with child linear growth (HAZ score), improved sanitation coverage is not associated with diarrhea. This is because while several key pathogens have been identified as important etiological agents of moderate to severe diarrheal disease affecting children in Cambodia, including pathogenic *E. coli* and rotavirus,[27] many others may be common asymptomatic infections not resulting in a diarrhea episode. Moreover, these asymptomatic infections may be closely linked with reduced gut function, reduced nutrient absorption, and reduced linear growth. Thus, this impact evaluation will collect children's stool samples, at endline, to measure the prevalence of enteric infections (both symptomatic and asymptomatic) rather than relying on self-reported diarrhea. Collecting data on this secondary outcome measure has the potential to make a significant contribution to the evidence base on the interaction effects between sanitation and faltering child growth.

[27] Chhour Y. Meng et al., "Etiology of diarrhea in young children and patterns of antibiotic resistance in Cambodia," *The Pediatric Infectious Disease Journal*, 30 no.4 (2011).

TABLE 14:VARIABLES ASSOCIATED WITH CHILD STUNTING AND LINEAR GROWTH

VARIABLE	Stunting OR (95% CI)	HAZ Coefficient (95% CI)
Male child	1.53***	-0.18***
	(1.25 - 1.87)	(-0.25 - -0.11)
Child's age in months	1.10***	-0.06***
	(1.07 - 1.13)	(-0.07 - -0.05)
Birth weight	0.21***	0.81***
	(0.16 - 0.27)	(0.73 - 0.90)
Currently breastfed	1.02	-0.13**
	(0.74 - 1.41)	(-0.26 - -0.00)
Diarrhea in past week	1.21*	-0.07
	(0.98 - 1.48)	(-0.15 - 0.02)
Minimum dietary diversity	0.84	0.05
	(0.64 - 1.10)	(-0.03 - 0.14)
Minimum meal frequency	1.17	0.01
	(0.86 - 1.60)	(-0.09 - 0.11)
Mother's age	1.01	-0.01
	(0.99 - 1.03)	(-0.01 - 0.00)
Maternal education at least primary	1.00	0.05
	(0.73 - 1.37)	(-0.08 - 0.17)
Paternal education at least primary	0.78*	0.07
	(0.59 - 1.03)	(-0.04 - 0.18)
Number of household members	1.00	-0.02*
	(0.94 - 1.06)	(-0.04 - 0.00)
Household wealth index score (ex-WASH)	0.92**	0.03**
	(0.86 - 0.98)	(0.01 - 0.05)
Improved drinking water source	0.93	-0.04
	(0.72 - 1.21)	(-0.12 - 0.04)
Improved sanitation facility	0.96	0.08**
	(0.75 - 1.24)	(0.00 - 0.17)
Adequate disposal of child's stool	0.86	0.04
	(0.68 - 1.10)	(-0.04 - 0.12)
Village open defecation rate	1.02	0.01
	(0.65 - 1.61)	(-0.13 - 0.16)
Constant	5.06***	-2.52***
	(1.55 - 16.57)	(-2.94 - -2.10)
Observations	3,191	3,174
R-squared		0.208
Number of groups	491	

*** p<0.01, ** p<0.05, * p<0.1; OR=odds ratio, 95% confidence interval in parentheses are constructed from linearized standard errors, which are clustered at the village level and stratified by commune.

TABLE 15: VARIABLES ASSOCIATED WITH DIARRHEA

VARIABLES	Diarrhea OR (95% CI)
HAZ score	0.94**
	(0.88 - 1.00)
Male child	1.23***
	(1.06 - 1.42)
Child's age in months	0.98**
	(0.96 - 1.00)
Birth weight	1.04
	(0.87 - 1.25)
Currently breastfed	0.81*
	(0.65 - 1.02)
Minimum dietary diversity	0.95
	(0.79 - 1.14)
Minimum meal frequency	1.03
	(0.80 - 1.32)
Mother's age	1.00
	(0.99 - 1.01)
Maternal education at least primary	1.22
	(0.95 - 1.56)
Paternal education at least primary	0.93
	(0.74 - 1.18)
Number of household members	1.00
	(0.95 - 1.05)
Household wealth index score (no WASH)	0.92***
	(0.87 - 0.97)
Improved drinking water source	0.93
	(0.76 - 1.13)
Improved sanitation facility	1.08
	(0.92 - 1.26)
Adequate disposal of child's stool	0.74***
	(0.59 - 0.91)
Village open defecation rate	1.26
	(0.91 - 1.75)
Constant	0.41**
	(0.18 - 0.90)
Observations	3,369
Number of groups	491

*** p<0.01, ** p<0.05, * p<0.1; OR=odds ratio, 95% confidence interval in parentheses are constructed from linearized standard errors, which are clustered at the village level and stratified by commune.

CONCLUSIONS

Baseline Characteristics across Groups

This baseline report shows a snapshot of key demographics, household characteristics, and outcome variables for each of the study groups. The four study groups are balanced across a range of characteristics of the households, primary caregivers, and their children under age 2. However, there were some differences in certain indicators. In particular, mothers in the control group are slightly less educated than those in the nutrition only group, and spouses in the control group and sanitation/hygiene only group are less educated than those in the nutrition only group. Households in the nutrition only group tend to be slightly wealthier than households in the control group. The current use of an improved drinking water source is lower for the nutrition only and sanitation/hygiene only groups relative to the control group. While more than half of the children meet the recommended minimum meal frequency, fewer children in the sanitation/hygiene only group meet the minimum relative to the nutrition+sanitation/hygiene group. Finally, children in the sanitation/hygiene only group have lower HAZ scores relative to the nutrition only group; however, there are no differences in stunting.

Since assignment to the treatment and control groups was randomized, differences between the groups are due to chance and not to the treatment itself. Thus, there is no selection bias in the design, but the differences can be adjusted for in the endline analysis.

Variables Associated with Child Linear Growth and Stunting

The evaluation team used the baseline data to examine variables associated with child linear growth and stunting. Holding other factors constant, child stunting shows a statistically significant association with the child's sex and age, birth weight, episode of diarrhea in the week before the survey, paternal education, and household wealth. These same variables are associated with child linear growth, in addition to currently breastfeeding, number of household members, and improved sanitation facility. While diarrhea and improved sanitation coverage are separately associated with child linear growth (HAZ score), improved sanitation coverage is not directly associated with diarrhea. This may be because while several key pathogens have been identified as important etiological agents of moderate to severe diarrheal disease affecting children in Cambodia, many others may be common asymptomatic infections not resulting in a diarrhea episode. Moreover, these asymptomatic infections may be closely linked with reduced gut function, reduced nutrient absorption, and reduced linear growth. Thus, this impact evaluation will collect children's stool samples, at endline, to measure the prevalence of enteric infections (both symptomatic and asymptomatic) rather than relying on self-reported diarrhea. Collecting data on this secondary outcome measure has the potential to make a significant contribution to the evidence base on the interaction effects between sanitation and faltering child growth.

Exposure to Any Nutrition and Sanitation/Hygiene Interventions at Baseline

The baseline data also shows there is room for improvement in the uptake of nutrition and sanitation interventions as well as key indicators potentially linked to stunting. For example, only half of the households have received a home visit from a village health agent, and less than a third of households have participated in any village-level activity focused on the first 1,000 days. Given that household wealth is associated with child health and nutrition, interventions that aim to increase a household's purchasing power—such as the CCT program and vouchers for latrines, water filters, and food baskets—are

valuable. Currently, only 15 percent of households have participated in a CCT program,[28] and about 6 percent of households have received a voucher or other form of subsidy for these products. Birth weight is also an important factor associated with faltering growth, so activities targeting pregnant women, including CCT incentives to make at least four antenatal visits in a public health center and for adequate weight gain and diet during pregnancy, are important. Improvements in infant and young child feeding practices are another area where NOURISH can make a difference. While early breastfeeding is nearly universal, continued breastfeeding starts to fall sharply after a child's first year. Food dietary diversity is mostly driven by the consumption of grains, flesh meat, and vitamin A rich produce, with very little consumption of dairy and eggs (dairy is not part of the local diet).

On the sanitation side, only 36 percent of households report having participated in any CLTS activity,[29] and out of those participating, only 14 percent then went on to build a latrine. It will be particularly important for the NOURISH team to continue linking supply-side sanitation activities to the CLTS demand-generating activities so that improved sanitation coverage increases enough to allow the evaluation team to measure changes in outcomes. Sanitation/hygiene conditions and behaviors also have room for improvement given that only 52 percent of households always treat their water to make it safer to drink, only 56 percent of households have an adequate handwashing station with water and soap, and only 39 percent of households have an improved sanitation facility. Moreover, the risk of fecal-oral contamination for children remains high, with 35 percent of households still practicing open defecation and 35 percent of households reporting inadequate disposal of young children's stool. Given that improved sanitation coverage varies substantially by wealth quintile, NOURISH's efforts to target poorer households will have the most value-added.

Additional Outcomes to be Collected at Endline

The endline survey will include more detailed questions and additional outcomes that were defined in the Evaluation Design Proposal but were not part of the baseline. In particular, the endline will include more detailed questions on latrine use; sanitary conditions of the household environment; and uptake of key infant and young child feeding, care, hygiene, and sanitation practices. The achievement of gross motor skills will provide insights into early childhood development. In addition to conducting a survey questionnaire, the evaluation team will collect children's stool samples to measure the prevalence of both symptomatic and asymptomatic enteric infections. This secondary outcome is more proximal than stunting (primary outcome) on the causal chain, and is also an objective measure that is more reliable than self-reported diarrhea (tertiary outcome). However, analysis of the stool samples also adds significant cost to data collection and analysis. Given budget considerations, two other secondary outcomes—(1) measures of EED, or gut function, which may be the primary mechanism linking WASH and undernutrition, and (2) soil-transmitted helminth infections—will be conducted only if additional funds are secured in the future.

Revisiting Power Calculations

Finally, the evaluation team used the baseline data to revisit the MDES calculations. In the Evaluation Design Proposal, the evaluation team conducted the power calculations using estimated baseline mean, SD, and ICC for the HAZ score (the primary outcome of interest) from the 2014 DHS data and HARVEST baseline data. Using the baseline data, the evaluation team revised the power calculations

[28] Responses about enrollment in a CCT program may be overestimated. Given the lack of CCT programs in the study area, as reported by NOURISH, it is possible that respondents were not clear to what a CCT referred.

[29] During data collection, explaining the meaning of CLTS to respondents proved difficult, so respondents may have inaccurately reported their exposure to a CLTS activity and instead responded about any village-level sanitation activity.

using actual baseline parameters from the study area. Keeping sample size constant so as not to further increase costs, the study has sufficient power to detect a MDES of 0.19 for differences in HAZ scores between treatment groups and a MDES of 0.18 for differences between each treatment group and the control group. Using the actual baseline HAZ mean of -0.96 and standard deviation of 1.187, this translates to a 23.4 percent change in HAZ scores between treatment groups, and a 22.2 percent change in HAZ scores between treatment and control groups. Despite these revisions, the evaluation is still well positioned to measure the changes anticipated by NOURISH.

ANNEX A: DESCRIPTION OF NOURISH INTERVENTIONS

The main NOURISH nutrition and sanitation/hygiene interventions consist of demand-creation activities, supply-side support, and capacity building at the village and commune levels, and are further described below.

Nutrition Interventions:

The **Community Nutrition** component uses evidence-based integrated nutrition interventions for the "first 1,000 days" of life. Village Health Support Groups (VHSGs), supervised by health workers and Commune Councils for Women and Children (CCWC), improve child care and development at multiple levels: individual, family, and community. Four core activities comprise the community initiative designed to prevent malnutrition:

- Village and commune dialogues and events review the growth data of children and link families with technical experts to facilitate access to diverse foods.
- VHSGs monitor every child every month. Children who are sick or not growing well are referred to health centers or referral hospitals, as appropriate, and followed up at home after treatment.
- VHSGs and Mother Support Group (MSG) members provide tailored interpersonal communication during home visits to promote child care and feeding practices, home hygiene, and proper use of latrines and handwashing stations.
- Caregiver peer groups, existing groups in the community such as MSGs, agricultural cooperatives, and women's savings groups learn about child care and development and foster an environment of social support for change. Fifteen topics are facilitated once per month within regular group activities, and include hygiene and age-specific care and feeding practices.

SBCC consists of media and materials to promote key behaviors in health and sanitation/hygiene. The project's SBCC framework is grounded in evidence of what works in social and behavior change and foundational work done by NOURISH in its first year. On the nutrition side, SBCC will support all components of BFCI and will be implemented by community change agents (VHSGs and caregiver peer groups).

- The VHSG SBCC package will include materials that emphasize the national BFCI flipchart, tested materials from other USAID-funded projects (i.e., Cambodia Helping Address Rural Vulnerabilities and Ecosystem Stability [HARVEST], the Rice Field Fisheries Enhancement Project [RFFEP]), and pictorial home visit checklists. To complement the print materials, NOURISH is also planning to provide short audio messages and counseling videos that contain instructions on issues that are difficult to explain through discussion (e.g., thickness and amount of food for young children).
- The caregiver peer group SBCC package will include a 15-session "first 1,000 days" Care and Protection Learning Session Guide and accompanying short video stories. These sessions will have nutrition and sanitation/hygiene topics based on tested materials in Cambodia, together with hands-on experiential activities that weave in key concepts of community empowerment, women's self-efficacy, and mutual support.
- The "first 1,000 days" family SBCC package will be centered on a Family Commitment Card enumerating the critical practices and allowing families to prioritize behaviors and visualize successes and gaps. As the Family Card is filled with accomplishments, the family will be recognized as a growth champion with a child book and other incentives to mark its

accomplishment. A behavior wheel checklist to guide home visits showing health/nutrition and sanitation/hygiene practices will supplement the Family Card.

CCT is a social safety net mechanism for poor "first 1,000 days" families, serving as an incentive for women to access services, practice specific behaviors, and overcome constraints related to poverty. Eligible families (based on poverty status) can receive up to six payments, for a total of $65 over the first 1,000 days of a child's life, which are transferred directly into women's bank accounts after completed use of health and nutrition services.

- First transfer: $12.50 at 1 month postpartum. Conditions: At least four antenatal care visits, delivery in a health center, and at least two postnatal care visits.
- Remaining five transfers: $10 for the second to fifth transfers and $12.50 for the last transfer over the next 23 months postpartum. Conditions: Monthly monitoring of children's growth through Growth Monitoring and Promotion at the health centers or in the community, and handwashing station at home.

Integrated Vouchers serve as another mechanism to encourage demand and overcome access constraints related to poverty. Vouchers will be distributed to poor "first 1,000 days" families in communes where the CCT is implemented, and will be redeemable for discounts on three products: water filters ($5 co-payment), two food baskets ($5 co-payment), and latrine materials ($15 co-payment). NOURISH is still working on being able to distribute vouchers in sanitation/hygiene-only communes, where there is no CCT link.

Sanitation/Hygiene Interventions:

CLTS aims to achieve sustained behavior change through the process of community "triggering" leading to spontaneous and long-term abandonment of open defecation practices, conducted in collaboration with the Ministry of Rural Development and provincial and district departments of rural development. In alignment with national Open Defecation Free certification guidelines, CLTS will cover entire villages to minimize the risk of fecal-oral contamination for all children. Following CLTS triggering, NOURISH will monitor the commitments of families and communities.

Supply-side support (private sector engagement) consists of collaborating with private and public sector actors to develop locally sensitive market-oriented approaches for the integrated business service centers around "first 1,000 days" products and services. NOURISH will encourage knowledge sharing across small- and medium-sized enterprises (SMEs) as well as utilize existing resource centers and agencies to develop the capacity of SMEs for effective service delivery and to increase their outreach to poor and relatively remote areas. Learning and exposure visits will help SMEs expand their business by diversifying products and services. NOURISH will identify a number of successful businesses within or outside the project area and organize interfaces between new and existing businesses to give mutual learning opportunities between SMEs and develop linkages for possible collaboration. NOURISH will also assist the selected SMEs to develop promotional materials with technical specification, price of products and services (bundling), and contact of SMEs. The promotional materials will be disseminated in public fora, meetings, and social events. This will enable consumers to directly contact a supplier or manufacturer for detailed information and purchase order. In addition, suppliers are linked to communes where CLTS triggering has occurred so they can follow-up with households that commit to purchasing or building latrines.

SBCC on the sanitation/hygiene side will consist of sanitation campaigns in primary schools to ensure children become agents of change and carry new behaviors home. As change agents, children have the potential to convince their families to construct latrines or purchase a handwashing station, and to use them.

ANNEX B: LITERATURE REVIEW

There are at least three pathways by which WASH interventions might plausibly improve childhood nutritional status: by reducing diarrheal disease infections, by preventing intestinal worm infections, and by reducing the risk of sub-clinical damage to the gut.[30] Diarrhea – the majority of which is attributed to inadequate WASH[31] – is both a cause and an effect of undernutrition: children with diarrhea eat less and are less able to absorb the nutrients from their food, and in turn, malnourished children are more susceptible to diarrhea and other infections.[32] Analysis of longitudinal data spanning two decades and across five countries found that the risk of stunting for a child increased multiplicatively for each case of diarrhea experienced before 24 months of age.[33] In addition, intestinal worm infections associated with poor sanitation are associated with both growth and cognitive development deficits.[34] Lastly, there is growing evidence that chronic exposure to fecal bacteria may result in changes to gut structure and function without manifesting as diarrhea.[35] This condition, Environmental Enteric Dysfunction (EED), also called Environmental Enteropathy or Tropical Enteropathy, is an asymptomatic syndrome characterized by chronic inflammation, reduced nutrient absorption of the intestine, and a weakened barrier function of the small intestine, and has been hypothesized as the principle pathways by which poor sanitation affects growth in children.[36, 37, 38] Thus, WASH interventions that effectively reduce exposure to fecal pathogens may be an important means to securing optimal nutritional outcomes for children.[39]

There is strong evidence suggesting the potential for synergies between WASH and nutrition interventions on the outcome of early childhood growth. On the WASH side, unsafe water, inadequate sanitation, and poor hygiene conditions enable the transmission of enteric pathogens from infected individuals to new susceptible hosts. Moreover, WASH-related enteric infections result in diarrheal diseases and may contribute to chronic inflammation of the gut,[40] leading to reduced absorption of nutrients and undernutrition,[41] EED,[42] growth faltering and stunting,[43] and death.[44] These risks are borne predominantly by children. On the nutrition side, systematic reviews have estimated the effects of

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[30] Alan D. Dangour et al, "Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutritional status of children," *Cochrane Database of Systematic Reviews*, Issue 8 (2011).
[31] Annette Prüss-Ustün et al., "Burden of disease from inadequate water, sanitation and hygiene in low-and middle-income settings: a retrospective analysis of data from 145 countries," *Tropical Medicine & International Health*, 19, no. 8 (2014).
[32] Richard L. Guerrant et al., "Diarrhea as a cause and an effect of malnutrition: diarrhea prevents catch-up growth and malnutrition increases diarrhea frequency and duration," *The American Journal of Tropical Medicine and Hygiene*, 47, no. 1 Pt 2 (1992).
[33] William Checkley et al., "Multi-country analysis of the effects of diarrhea on childhood stunting," *International Journal of Epidemiology*, 37, no. 4 (2008).
[34] Jeffrey Bethony et al., "Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm," *The Lancet*, 367, no. 9521 (2006).
[35] Jean H. Humphrey, "Child undernutrition, tropical enteropathy, toilets, and handwashing," *The Lancet*, 374, no. 9694 (2009).
[36] David I. Campbell et al., "Chronic T cell-mediated enteropathy in rural West African children: relationship with nutritional status and small bowel function," *Pediatric Research*, 54, no. 3 (2003).
[37] Humphrey, (2009).
[38] Noel W. Solomons, "Environmental contamination and chronic inflammation influence human growth potential," *The Journal of Nutrition*, 133, no. 5 (2003).
[39] Dangour et al., (2013).
[40] Humphrey, (2009).
[41] Francis M. Ngure et al., "Water, sanitation, and hygiene, environmental enteropathy, nutrition, and early child development: making the links," *Annals of the New York Academy of Sciences*, 1308, no. 1 (2014).
[42] Sue McKay et al., "Environmental enteropathy: new targets for nutritional interventions," *International Health*, 2, no. 3 (2010).
[43] McCormick, B.J., "Frequent symptomatic or asymptomatic infections may have long-term consequences on growth and cognitive development," In Old Herborn University Seminar Monographs, (2014).
[44] Sandy Cairncross et al., "Water, sanitation and hygiene for the prevention of diarrhea," *International Journal of Epidemiology*, 39, suppl 1 (2010).

nutrition interventions on stunting and death.[45] The Lancet series on Maternal and Child Undernutrition concluded that existing interventions that were designed to improve nutrition and prevent related disease could reduce stunting at 36 months by 36 percent and mortality between birth and 36 months by about 25 percent, and that in populations with sufficient food, education about complementary feeding increased height-for-age Z-score (HAZ) by 0.15 (95 percent confidence interval [CI] 0.01–0.49). However, it also showed that even ideal nutritional interventions are insufficient to prevent more than a third of stunting, an insight that has generated increased interest in nutrition-sensitive interventions, including WASH.

Therefore, WASH interventions alone may also reduce stunting in children, though the strength of association is weak and few studies have measured this directly.[46] Evidence for the associations between improvements in sanitation and gut function, stunting, and death is lacking, with estimates of impact mostly theoretical, following from the observation that diarrhea[47] and persistent enteric infections[48] lead to enteric dysfunction and stunting in children over time as well as a limited number of recently published trials.[49,50] The recent Cochrane systematic review found five cRCTs and identified a borderline statistically significant effect of WASH interventions of 0.08 HAZ mean difference (95%CI: 0.00–0.16), although an Individual Participant Data analysis of children under 24 months found a much larger, statistically significant effect of 0.23 HAZ mean difference (95%CI: 0.14-0.35). Moreover, the scarce literature on the health benefits of improvements in WASH conditions is mixed due to improper implementation of the planned interventions, lack of usage of the facilities, and design and measurement problems of the evaluations.[51]

Although no sanitation interventions were identified in this Cochrane review, five trials have subsequently published results for the effect of sanitation interventions on stunting. Two of these studies[52, 53] found significant effects on stunting and three found no effect.[54, 55, 56] Notably, the interventions for those trials reporting no effect had very low levels of uptake and compliance, which may explain their findings of no effect. This epidemiological literature confirms what is well known by many WASH implementers that the requisite changes in behavior are hard to initiate and even harder to sustain over time.

Finally, there have not been rigorous evaluations of WASH and nutrition interventions to assess whether synergistic effects are seen. Two large studies are currently underway in Bangladesh and Kenya

[45] Zulfiqar A. Bhutta et al., "What works? Interventions for maternal and child undernutrition and survival," *The Lancet,* 371, no. 9610 (2008).
[46] Dangour et al., (2013).
[47] Checkley et al. (2008).
[48] Peter G. Lunn, "Growth retardation and stunting of children in developing countries," *British Journal of Nutrition*, 88, no. 2 (2002).
[49] Jeffrey Hammer and Dean Spears, "Village sanitation and children's human capital: evidence from a randomized experiment by the Maharashtra government," *World Bank Policy Research Working Papers,* #6580 (2013).
[50] Lisa Cameron, Manisha Shah, and Susan Olivia, "Impact evaluation of a large-scale rural sanitation project in Indonesia," *World Bank Policy Research Working Papers*, #6360 (2013).
[51] Dangour et al., (2013).
[52] Hammer and Spears, (2013).
[53] Amy J. Pickering et al., "Effect of a community-led sanitation intervention on child diarrhoea and child growth in rural Mali: a cluster-randomised controlled trial," *The Lancet Global Health*, 3, no. 11 (2015).
[54] Cameron et al., (2013).
[55] Thomas Clasen et al., "Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial," *The Lancet Global Health*, 2, no. 11 (2014).
[56] Sumeet R. Patil et al., "The effect of India's total sanitation campaign on defecation behaviors and child health in rural Madhya Pradesh: a cluster randomized controlled trial, *PLoS Medicine*, 11, no. 8 (2014).

(WASH-Benefits),[57] and another one in Zimbabwe (Sanitation Hygiene Infant Nutrition Efficacy, or SHINE), [58] which will yield further insights on the connections between WASH, nutrition, gut health, and a range of health outcomes including stunting. However, all of these studies are efficacy studies – designed to assess the effect of the interventions under optimal if unscaleable conditions – and there is a pressing need for a large-scale effectiveness study that will assess the effect of an integrated WASH and nutrition intervention on nutritional outcomes under real world conditions.

[57] Benjamiin F. Arnold et al., "Cluster-randomised controlled trials of individual and combined water, sanitation, hygiene and nutritional interventions in rural Bangladesh and Kenya: the WASH Benefits study design and rationale," *BMJ Open*, 3, no. 8 (2013).
[58] Jean H. Humphrey et al., "The Sanitation Hygiene Infant Nutrition Efficacy (SHINE) Trial: Rationale, Design, and Methods," *Clinical Infectious Diseases*, 61, suppl 7 (2015).

ANNEX C: BASELINE SURVEY INSTRUMENTS

Cambodia Nutrition and Sanitation Baseline Survey
For Primary Caregiver and Young Children

IDENTIFICATION	
PROVINCE:	CODE: |___|___|
DISTRICT:	CODE: |___|___|
COMMUNE:	CODE: |___|___|
VILLAGE:	CODE: |___|___|___|

SCREENING QUESTIONS	
Q1. Is there a child aged 0 to 24 months living in this household?	1. YES 2. NO → STOP INTERVIEW
[ASK TO SPEAK WITH THE MOTHER OR PRIMARY CAREGIVER OF THE CHILDREN 0 TO 24 MONTHS]	
NAME OF RESPONDENT:	
PHONE NUMBER OF HOUSEHOLD CONTACT: |___|___|___|___|___|___|___|___|___|	

INTERVIEW DETAILS						
VISITS	DATE	TIME		NEXT SCHEDULED VISIT		RESULT FROM VISIT (*)
		START	END	DATE	TIME	
FIRST	___/___/___	__ __:__ __	__ __:__ __	___/___/___	__ __:__ __	|___|___|
SECOND	___/___/___	__ __:__ __	__ __:__ __	___/___/___	__ __:__ __	|___|___|
THIRD	___/___/___	__ __:__ __	__ __:__ __			|___|___|

* CODES

[11] Completed	[44] Started, but incomplete	[77] Dwelling vacant or not found
[22] Not home at time of visit	[55] Absent for duration of study	[88] Not eligible for survey
[33] Rescheduled	[66] Refused to participate	

QUALITY CONTROL			
INTERVIEWER	SUPERVISOR	OPERATOR	DATA ENTRY
NAME: _____ |__|__|	NAME: _____ |__|__|	NAME: _____ |__|__|	NAME: _____ |__|__|
DATE: ____/____/____	DATE: ____/____/____	DATE: ____/____/____	DATE: ____/____/____
	CORRECTED? YES / NO	CORRECTED? YES / NO	

Informed Consent Form

Hello. My name is _____. I am working with KHANA Center for Population Health Research, a research firm based in Phnom Penh, with approval from the Ministry of Health and the Provincial Health Department. We are conducting a survey about child nutrition in Battambang, Pursat, and Siem Reap. The information we collect will help inform development of targeted activities to improve child nutrition in your area. Your household was randomly selected to participate in the survey.

I would like to ask you some questions about your household. The questions usually take about 20 minutes. We would also like to collect height and weight measurements of all the children aged 0 to 24 months in your household.

All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. We do not anticipate any risks or discomfort to you by participating. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on this information sheet. *[GIVE PARTICIPANT INFORMATION SHEET]*

Do you have any questions?

Q2. Do you understand and agree to participate in this survey? 1. YES 2. NO → STOP INTERVIEW
Q3. For the children aged 0 to 24 months, may we weigh them and take their height measurement? 1. YES 2. NO → STOP INTERVIEW

_____ _____

Signature of Respondent Date

[ASK THE RESPONDENT TO PREPARE
THE CHILD'S YELLOW HEALTH CARD AND BIRTH CERTIFICATE IF AVAILABLE]

We will start this interview with a few questions to get basic information about you.

I. BASIC INFORMATION FROM PRIMARY CAREGIVER	
Q4. In what month and year were you born? *[ASK FOR IDENTIFICATION CARD OR OTHER DOCUMENT TO CONFIRM DATE OF BIRTH]*	|___|___| Gregorian Month 88. Don't Know Month |___|___|___|___| Gregorian Year 8888. Don't Know Year
Q5. How old were you at your last birthday?	|___|___| Years
Q6. What is your religion?	1. Buddhist 2. Moslem 3. Christian 4. Other (Specify: _____)
Q7. What is the highest level of school you attended?	1. Never attended school 2. Primary (1 – 6) 3. Lower Secondary (7 – 9) 4. Upper Secondary (10 – 12) 5. Higher 6. Other (Specify: _____) 88. Don't Know
Q8. What is your current marital status?	1. Married or living together 2. Divorced or separated 3. Widow 4. Never married → SKIP TO Q10
Q9. What is the highest level of school your (spouse/partner) ever attended?	1. Never attended school 2. Primary (1 – 6) 3. Lower Secondary (7 – 9) 4. Upper Secondary (10 – 12) 5. Higher 6. Other (Specify: _____) 88. Don't Know
Q10. How many people currently live in this household, including yourself, other adults and all children who regularly sleep and eat in this household?	|___|___| People
Q11. Of the people who currently live in this household, how many are….: a) Children under 18 years old? b) Adults 18 years or older?	|___|___| Children |___|___| Adults
Q12. How many children aged 0 to 24 months live in this household?	|___|___| Children

I would now like to ask you questions about these children aged 0 to 24 months. Let's start with the name of each child.

II. BASIC INFORMATION FOR ALL CHILDREN 0 TO 24 MONTHS			
	CHILD 1	CHILD 2	CHILD 3
Q13. What is the child's name?	____________________	____________________	____________________
Q14. Are you (CHILD NAME)'s mother?	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
Q15. What is (CHILD NAME)'s gender?	1. Male 2. Female	1. Male 2. Female	1. Male 2. Female
Q16. Was (CHILD NAME) ever breastfed?	1. Yes 2. No → SKIP TO Q18	1. Yes 2. No → SKIP TO Q18	1. Yes 2. No → SKIP TO Q18
Q17. Is (CHILD NAME) still being breastfed?	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No
Q18. What is (CHILD NAME)'s birth date?	Day |___|___| Month |___|___| Year |___|___|___|___|	Day |___|___| Month |___|___| Year |___|___|___|___|	Day |___|___| Month |___|___| Year |___|___|___|___|
[CONFIRM Q18 WITH BIRTH CERTIFICATE OR YELLOW CARD]	1. Confirmed 2. No birth certificate / card	1. Confirmed 2. No birth certificate / card	1. Confirmed 2. No birth certificate / card
Q19. What was (CHILD NAME)'s weight at birth?	KG |___| . |___| [FROM CARD] 99. Card shown, birth weight <u>not</u> recorded KG |___| . |___| [FROM RECALL] 88. Don't Know	KG |___| . |___| [FROM CARD] 99. Card shown, birth weight <u>not</u> recorded KG |___| . |___| [FROM RECALL] 88. Don't Know	KG |___| . |___| [FROM CARD] 99. Card shown, birth weight <u>not</u> recorded KG |___| . |___| [FROM RECALL] 88. Don't Know
	GO TO CHILD 2 OR IF NO MORE CHILDREN SKIP TO SECTION III.	GO TO CHILD 3 OR IF NO MORE CHILDREN SKIP TO SECTION III.	

Now I would like to take the height and weight measurements of all of these children aged 0 to 24 months.

III. ANTHROPOMETRY MEASURES FOR SAME CHILDREN 0 TO 24 MONTHS			
	CHILD 1	CHILD 2	CHILD 3
[REWRITE CHILD NAME IN THE SAME ORDER]	_____	_____	_____
Q20.1 [FIRST TIME: RECORD WEIGHT IN KILOGRAMS]	KG |__|__| . |__|__|	KG |__|__| . |__|__|	KG |__|__| . |__|__|
Q20.2 [SECOND TIME: RECORD WEIGHT IN KILOGRAMS]	KG |__|__| . |__|__|	KG |__|__| . |__|__|	KG |__|__| . |__|__|
[*IF YOU HAVE A SCALE THAT DOES NOT AUTOMATICALLY SHOW THE CHILD'S WEIGHT, PROCEED BELOW]*			
Q20.1.1 [SECOND TIME: RECORD WEIGHT IN KILOGRAMS]	KG |__|__| . |__|__| [MOTHER AND CHILD] KG |__|__| . |__|__| [MOTHER ONLY]	KG |__|__| . |__|__| [MOTHER AND CHILD] KG |__|__| . |__|__| [MOTHER ONLY]	KG |__|__| . |__|__| [MOTHER AND CHILD] KG |__|__| . |__|__| [MOTHER ONLY]
Q20.1.2 [SECOND TIME: RECORD WEIGHT IN KILOGRAMS]	KG |__|__| . |__|__| [MOTHER AND CHILD] KG |__|__| . |__|__| [MOTHER ONLY]	KG |__|__| . |__|__| [MOTHER AND CHILD] KG |__|__| . |__|__| [MOTHER ONLY]	KG |__|__| . |__|__| [MOTHER AND CHILD] KG |__|__| . |__|__| [MOTHER ONLY]
[CONTINUE WITH HEIGHT MEASUREMENT BELOW]			
Q21.1 [FIRST TIME: RECORD HEIGHT IN CENTIMETERS]	CM |__|__|__| . |__|	CM |__|__|__| . |__|	CM |__|__|__| . |__|
Q21.2 [SECOND TIME: RECORD HEIGHT IN CENTIMETERS]	CM |__|__|__| . |__|	CM |__|__|__| . |__|	CM |__|__|__| . |__|
Q21.3 [THIRD TIME: ONLY IF DIFFERENCE BETWEEN MEASUREMENTS IS <u>GREATER THAN 1.0 CM</u> RECORD HEIGHT IN CENTIMETERS]	CM |__|__|__| . |__|	CM |__|__|__| . |__|	CM |__|__|__| . |__|
	GO TO CHILD 2 OR IF NO MORE CHILDREN SKIP TO SECTION IV.	GO TO CHILD 2 OR IF NO MORE CHILDREN SKIP TO SECTION IV.	

Now I would like to ask you some health questions about the same (child/children) we just measured.

IV. HEALTH OF SAME CHILDREN 0 TO 24 MONTHS			
	CHILD 1	CHILD 2	CHILD 3
[REWRITE CHILD NAME IN THE SAME ORDER]	_____	_____	_____
Q22. In the last 7 days, did (CHILD NAME) vomit on one or more days?	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know
Q23. In the last two weeks, did (CHILD NAME) have abdominal pain?	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know
Q24. In the last 7 days, did (CHILD NAME) have diarrhea? *[SHOW CARD]*	1. Yes → SKIP TO Q26 2. No 88. Don't Know	1. Yes → SKIP TO Q26 2. No 88. Don't Know	1. Yes → SKIP TO Q26 2. No 88. Don't Know
Q25. In the last 2 weeks, did (CHILD NAME) have diarrhea? *[SHOW CARD]*	1. Yes 2. No → SKIP TO SECTION V 88. Don't Know	1. Yes 2. No → SKIP TO SECTION V 88. Don't Know	1. Yes 2. No → SKIP TO SECTION V 88. Don't Know
Q26. During the time (CHILD NAME) had diarrhea, did (he/she) have fever on one or more days?	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know	1. Yes → On how many days? |___|___| Days 2. No 88. Don't Know
Q27. During the time (CHILD NAME) had diarrhea, did (he/she) ever have blood in stools?	1. Yes 2. No 88. Don't Know	1. Yes 2. No 88. Don't Know	1. Yes 2. No 88. Don't Know
Q28. On the worst day of this diarrhea episode, how many bouts of diarrhea did (he/she) have?	|___|___| Bouts 88. Don't Know	|___|___| Bouts 88. Don't Know	|___|___| Bouts 88. Don't Know
Q29. For how many days did (CHILD NAME) have 3 or more bouts?	|___|___| Days 88. Don't Know	|___|___| Days 88. Don't Know	|___|___| Days 88. Don't Know
	GO TO CHILD 2 OR SKIP TO SECTION V	GO TO CHILD 3 OR SKIP TO SECTION V	

V. CHILD DIETARY DIVERSITY – ONLY YOUNGEST CHILD 6 – 24 MONTHS

[CHOOSE THE RESPONDENT'S YOUNGEST CHILD BETWEEN 6 – 24 MONTHS OLD FOR THIS SECTION. MARK WHICH CHILD FROM Q13 THIS REFERS TO.]

1. CHILD 1
2. CHILD 2
3. CHILD 3
4. No child 6 – 24 months → SKIP TO SECTION VI

Q30. Now I would like you to please describe everything that your youngest child, (CHILD NAME), ate and drank yesterday during the day or night.

A. Think about when (CHILD NAME) first woke up yesterday. Did (he/she) eat anything at that time?

IF YES: Please tell me everything (he/she) at that time.
PROBE: Anything else?

B. What did (CHILD NAME) eat next?

IF YES: Please tell me everything (he/she) at that time.
PROBE: Anything else?
[CONTINUE UNTIL SHE SAYS NOTHING ELSE. DO THIS FOR THE ENTIRE DAY.

AS THE RESPONDENT RECALLS FOODS, CIRCLE THE "1" BY THE CORRESPONDING FOOD.

ONCE THE RESPONDENT FINISHES RECALLNG FOODS EATEN, READ EACH FOOD GROUP WHERE "1" WAS NOT ENTERED AND RECORD ANSWER.]

A.	Plain water?	1. Yes	2. No
B.	Instant formula?	1. Yes	2. No
C.	Milk such as tinned, powdered or fresh animal milk?	1. Yes	2. No
d.	Breastmilk?	1. Yes	2. No
E.	Juice or juice drinks?	2. Yes	2. No
F.	Plain soup broth?	1. Yes	2. No
G.	Borbor?	1. Yes	2. No
H.	Any other liquids? (Specify: _____)	1. Yes	2. No
I.	Food made from rice, noodles, porridge or other grains?	1. Yes	2. No
J.	Beans?	1. Yes	2. No
K.	Nuts and seeds such as peanut, cashew nut	1. Yes	2. No
L.	Pumpkin, carrots, squash, sweet potatoes that are yellow or orange?	1. Yes	2. No
M.	White potatoes, white yams, or any other foods from roots?	1. Yes	2. No
N.	Dark green, leafy vegetables like amaranth leaves, moringa, morning glory, water spinach?	1. Yes	2. No
O.	Ripe mangoes, ripe papayas, jackfruit?	1. Yes	2. No
P.	Any other fruits or vegetables? (Specify: _____)	1. Yes	2. No
Q.	Liver, kidney, heart, or other organ meats?	1. Yes	2. No
R.	Flesh foods like beef, pork, lamb, goat, chicken, or duck?	1. Yes	2. No
S.	Wild animals like frogs, snails, crabs, and insects?	1. Yes	2. No
T.	Duck or chicken eggs?	1. Yes	2. No
U.	Fresh or dried fish?	1. Yes	2. No
V.	Small rice field fish?	1. Yes	2. No
W.	Any foods made from beans, nuts, or seeds?	1. Yes	2. No
X.	Cheese, yogurt, or other milk products?	1. Yes	2. No
Y.	Any oil, fats, butter, or foods made with any of these?	1. Yes	2. No
Z.	Any sugary foods such as sweets, candies, cakes, or biscuits?	1. Yes	2. No
AA.	Any packaged snacks such as chips?	1. Yes	2. No
BB.	Condiments for flavor, such as soy sauce or prahok?	1. Yes	2. No

[CHECK Q30 ABOVE, CATEGORIES "I" THROUGH "BB": IF ALL "NO" ……..□ → CONTINUE TO Q31 IF AT LEAST ONE "YES" ……..□ → SKIP TO Q32	
Q31. Did (CHILD NAME) eat any solid, semi-solid, or soft foods yesterday during the day or at night? *[IF 'YES' PROBE]:* What kind of solid, semi-solid or soft foods did he/she eat yesterday?	1. Yes → GO BACK TO Q30 TO RECORD FOOD 2. No → SKIP TO SECTION VI
Q32. How many times did (CHILD NAME) eat solid, semi-solid, or soft foods yesterday, during the day or at night?	|___|___| Number of Times 88. Don't know

VI. PREGNANCY AND CHILD BIRTHS	
[IS RESPONDENT THE MOTHER OF ANY OF THE CHILDREN AGED 0 – 24 MONTHS THAT YOU MEASURED? CHECK IF ANSWERED "YES" TO ANY CHILD ON Q14.]	1. Yes 2. No → SKIP TO Q40
Q33. Did you receive antenatal care during your most recent pregnancy?	1. Yes 2. No
Q34. Are you pregnant now?	1. Yes 2. No 88. Don't Know
Q35. How many total births have you had in your life? *[THIS INCLUDES BIRTHS TO CHILDREN WHO WERE BORN ALIVE BUT LATER DIED AND THOSE WHO CURRENTLY LIVE ELSEWHERE].*	|___|___| Total Births

Now let me ask you about each of the children you have given birth to. Let's start with the name of each child, from the youngest to oldest.

CHILD_ID *[RECORD NAME]*	Q36. Is (CHILD NAME) a boy or a girl?	Q37. In what month and year was (CHILD NAME) born?	Q38. Is (CHILD NAME) still alive?	Q39. How old was (CHILD NAME) when (he/she) died?
1 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years
02 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years
03 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years
04 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years

05 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years
06 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years
07 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years
08 _____	1. Boy 2. Girl	|___|___| Month |___|___|___|___| Year 88. Don't Know	1. Yes → SKIP TO NEXT CHILD OR Q40 2. No	|___|___| Days |___|___| Months |___|___| Years

Q40. In the last 12 months, have you received :		
A. [LOCAL NAME: MULTIPLE MICRONUTRIENT POWDER]?	1. Yes	2. No
B. [LOCAL NAME: READY TO USE THERAPEUTIC FOOD LIKE PLUMPY'NUT]?	1. Yes	2. No
C. [LOCAL NAME: READY TO USE SUPPLEMENTAL FOOD LIKE PLUMPY'DOZ]?	1. Yes	2. No
D. Home visits from a village health support group?	1. Yes	2. No
E. Enrollment to a conditional cash transfer program for health?	1. Yes	2. No
F. Voucher or other form of subsidy to purchase water filter?	1. Yes	2. No
G. Voucher or other form of subsidy to purchase latrine or materials for latrine?	1. Yes	2. No
H. Voucher for food basket?	1. Yes	2. No

Q41. In the last 12 months, have you:		
A. Participated in Community Led Total Sanitation activities?	1. Yes	2. No
[*IF YES TO (A):]* Did you build a latrine as a result of this activity?	1. Yes	2. No
B. Participated in any first 1,000 days community dialogue?	1. Yes	2. No
C. Participation in any first 1,000 days caregiver group education sessions?	1. Yes	2. No
D. Heard or saw *Grow Together* campaign messages, or materials on TV or in print?	1. Yes	2. No

Now I would like to ask you some questions about water and sanitation in your household.

VII. HOUSEHOLD WATER AND SANITATION	
Q42. What is the main source of drinking water for members of your household right now? *[MARK ONE ANSWER ONLY]* *[IF THE FAMILY FETCHES DRINKING WATER FROM MULTIPLE SOURCES, ASK WHAT IS THE SOURCE <u>MOST</u> USED NOW].*	1. Piped into dwelling 2. Piped to yard or plot 3. Public tap / standpipe 4. Tube well or borehole 5. Protected dug well 6. Unprotected dug well 7. Protected spring 8. Unprotected spring 9. Rainwater 10. Tanker truck 11. Cart with small tank 12. Surface water (river, dam, lake, pond, canal, irrigation channel) 13. Bottled water 14. Other (Specify: _____)
Q43. Where is that water source located?	1. In own dwelling 2. In own yard/plot 3. Elsewhere → SKIP TO Q45
Q44. How long does it take to go there, get water, and come back?	|___|___|___| Minutes 88. Don't know
Q45. Do you do anything to the water to make it safer to drink?	1. Yes, always 2. Yes, sometimes 3. No 88. Don't know → SKIP TO Q47
Q46. What do you usually do to make the water safer to drink? Anything else? [RECORD ALL ANSWERS MENTIONED]	1. Boil 2. Add bleach or chlorine 3. Strain through cloth 4. Use water filter (ceramic sand/composite/etc.) 5. Solar disinfection 6. Let it stand and settle 7. Buy purified water 8. Other (Specify: _____) 88. Don't know
Q47. We would like to learn about the places that households use to wash their hands. Can you please show me where members of your household most often wash their hands?	1. Observed, fixed place 2. Observed, mobile 3. Not observed, not in dwelling/yard/plot 4. Not observed, no permission to see 5. Not observed, other reason → SKIP TO Q50
Q48. PRESENCE OF WATER AT THE PLACE FOR HANDWASHING. RECORD OBSERVATION.	1. Water is available 2. Water is not available
Q49. PRESENCE OF SOAP, DETERGENT, OR OTHER CLEANSING AGENT AT THE PLACE FOR HANDWASHING.	1. Soap or detergent (bar, liquid, powder, paste) 2. Ash, mud, sand 3. None

RECORD OBSERVATION	
Q50. What kind of toilet facility do members of your household usually use? *[IF ANSWER 1 – 10:* - *CONFIRM BY OBSERVATION* - *ASK FOR PERMISSION TO TAKE A PHOTO OF THE TOILET FACILITY USED IN THE HOUSEHOLD.* - *CHANGE PHOTO NAME TO QUESTIONNAIRE ID#. IF THIS IS NOT POSSIBLE, RECORD NOTES BELOW TO CHANGE NAME LATER.]* *PHOTO DETAILS:* _____ _____ _____	Flush or Pour Flush Toilet 1. Flush or pour flush to piped sewer system 2. Flush or pour flush to septic tank 3. Flush or pour flush to pit latrine 4. Flush our pour flush to somewhere else Pit Latrine 5. Ventilated improved pit latrine 6. Pit latrine with slab 7. Pit latrine without slab / open pit 8. Composting toilet 9. Bucket toilet 10. Hanging toilet / hanging latrine 11. No facility / bush / field → SKIP TO Q53 12. Use another household's latrine → SKIP TO Q53 13. Other (Specify: _____) [ANSWER ABOVE IS CONFIRMED BY OBSERVATION] 1. Observed 2. Not Observed [PHOTO TAKEN] 1. Yes 2. No → SPECIFY REASON: _____
Q51. Do you share your toilet facility with other households?	1. Yes 2. No 88. Don't Know → SKIP TO Q53
Q52. How many other households use this toilet facility?	|___|___| Households 88. Don't Know
Q53. The last time your youngest child passed stools in the past 24 hours, what was done to dispose of the stools?	1. Child used toilet or latrine 2. Put / rinsed into toilet or latrine 3. Put / rinsed into drain or ditch 4. Thrown into garbage 5. Buried 6. Left in the open 7. Other (Specify:_____)
Q54. Does your family have an ID Poor Card? *[REQUEST TO SEE THE CARD]*	1. Yes, observed card 2. Yes, not observed card 3. Yes, expired card 4. No 88. Don't know

We are almost done. I will now ask you a few additional questions about your household.

VIII. HOUSEHOLD CHARACTERISTICS			
Q55. Does your household have:	A. Electricity?	1. Yes	2. No
	B. A radio?	1. Yes	2. No
	C. A television?	1. Yes	2. No
	D. A mobile telephone?	1. Yes	2. No
	E. A non-mobile telephone?	1. Yes	2. No
	F. A refrigerator?	1. Yes	2. No
	G. A wardrobe?	1. Yes	2. No
	H. A sewing machine or loom?	1. Yes	2. No
	I. A CD/DVD player?	1. Yes	2. No
	J. A generator / battery / solar panel?	1. Yes	2. No

Q56. What type of fuel does your household mainly use for cooking?	1. Electricity 2. LPG 3. Biogas 4. Kerosene 5. Coal, lignite 6. Charcoal 7. Wood 8. Straw / shrubs / grass 9. Agricultural crop 10. Animal Dung 11. No food cooked in household 12. Other (Specify: _____)
Q57. MAIN MATERIALS OF THE FLOORS RECORD OBSERVATION	1. Earth / Sand / Clay 2. Dung 3. Wood planks 4. Palm / bamboo 5. Parquet or polished wood 6. Vinyl or asphalt strips 7. Ceramic tiles 8. Cement tiles 9. Cement 10. Floating house 11. Other (Specify: _____)
Q58. MAIN MATERIAL OF THE ROOF RECORD OBSERVATION	1. No Roof 2. Bamboo / thatch / palm leaf 3. Rustic mat 4. Wood planks 5. Cardboard 6. Plastic sheet 7. Metal 8. Wood 9. Calamine / cement fiber 10. Ceramic tiles 11. Clay tiles

	12. Cement 13. Other (Specify: _____)
Q59. MAIN MATERIAL OF EXTERIOR WALLS RECORD OBSERVATION	1. No walls 2. Palm / bamboo / thatch 3. Dirt 4. Bamboo with mud 5. Straw with mud 6. Stone with mud 7. Uncovered adobe 8. Plywood 9. Cardboard 10. Reused wood 11. Metal 12. Cement 13. Stone with lime/cement 14. Bricks 15. Cement blocks 16. Covered adobe 17. Wood planks / shingles 18. Other (Specify: _____)

Q60. How many rooms in this household are used for sleeping?	|___|___| Rooms		88. Don't Know	
Q61. Does any member of this household own:	A. Watch?	1. Yes	2. No	
	B. Bicycle or cyclo?	1. Yes	2. No	
	C. Motorcycle or motor scooter?	1. Yes	2. No	
	D. Motorcycle cart?	1. Yes	2. No	
	E. Oxcart or horsecart?	1. Yes	2. No	
	F. Car, truck, tractor, or van?	1. Yes	2. No	
	G. Boat with a motor?	1. Yes	2. No	
	H. Boat without a motor?	1. Yes	2. No	

That concludes our interview. Thank you for your time and participation.

Cambodia Nutrition and Sanitation Baseline Survey
For General Households

IDENTIFICATION	
PROVINCE:	CODE: |___|___|
DISTRICT:	CODE: |___|___|
COMMUNE:	CODE: |___|___|
VILLAGE:	CODE: |___|___|___|

[ASK TO SPEAK WITH THE HEAD OF HOUSEHOLD OR THE SPOUSE. IF NEITHER IS AVAILABLE ASK TO SPEAK WITH SOMEONE OVER 18 WHO IS KNOWELDGEABLE ABOUT THE WATER AND SANITATION CONDITION OF THE HOUSHEOLD]
NAME OF RESPONDENT:
PHONE NUMBER OF HOUSEHOLD CONTACT: |___|___|___|___|___|___|___|___|___|

INTERVIEW DETAILS						
VISITS	DATE	TIME		NEXT SCHEDULED VISIT		RESULT FROM VISIT (*)
		START	END	DATE	TIME	
FIRST	___/___/___	__ __:__ __	__ __:__ __	___/___/___	__ __:__ __	|___|___|
SECOND	___/___/___	__ __:__ __	__ __:__ __	___/___/___	__ __:__ __	|___|___|
THIRD	___/___/___	__ __:__ __	__ __:__ __			|___|___|

* CODES
[11] Completed
[22] Not home at time of visit
[33] Rescheduled
[44] Started, but incomplete
[55] Absent for duration of study
[66] Refused to participate
[77] Dwelling vacant or not found
[88] Not eligible for survey

QUALITY CONTROL			
INTERVIEWER	SUPERVISOR	OPERATOR	DATA ENTRY
NAME: _____ |___|___|	NAME: _____ |___|___|	NAME: _____ |___|___|	NAME: _____ |___|___|
DATE: ____/____/____	DATE: ____/____/____	DATE: ____/____/____	DATE: ____/____/____
	CORRECTED? YES / NO	CORRECTED? YES / NO	

Informed Consent Form

Hello. My name is _____. I am working with KHANA Center for Population Health Research, a research firm based in Phnom Penh, with approval from the Ministry of Health and the Provincial Health Department. We are conducting a survey about access to water and sanitation facilities in your community and across Battambang, Pursat, and Siem Reap. The information we collect will help inform development of targeted activities to improve child nutrition in your area. Your household was randomly selected to participate in the survey.

I would like to ask you some questions about your household. The questions usually take about 10 minutes.

All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. We do not anticipate any risks or discomfort to you by participating. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on this information sheet.
[GIVE PARTICIPANT INFORMATION SHEET]

Do you have any questions?

Q1. Do you understand and agree to participate in this survey?
1. YES 2. NO → STOP INTERVIEW

_____ _____
Signature of Respondent Date

I will start this interview by asking you a few questions on your household's water and sanitation situation.

SECTION I: HOUSEHOLD WATER AND SANITATION	
Q2. What is the main source of drinking water for members of your household right now? *[MARK ONE ANSWER ONLY]* *[IF THE FAMILY FETCHES DRINKING WATER FROM MULTIPLE SOURCES, ASK WHAT IS THE SOURCE <u>MOST</u> USED NOW].*	1. Piped into dwelling 2. Piped to yard or plot 3. Public tap / standpipe 4. Tube well or borehole 5. Protected dug well 6. Unprotected dug well 7. Protected spring 8. Unprotected spring 9. Rainwater 10. Tanker truck 11. Cart with small tank 12. Surface water (river, dam, lake, pond, canal, irrigation channel) 13. Bottled water 14. Other (Specify: _____)
Q3. Where is that water source located?	1. In own dwelling 2. In own yard/plot 3. Elsewhere → SKIP TO Q5
Q4. How long does it take to go there, get water, and come back?	|___|___|___| Minutes 88. Don't know
Q5. Do you do anything to the water to make it safer to drink?	1. Yes, always 2. Yes, sometimes 3. No 88. Don't know → SKIP TO Q7
Q6. What do you usually do to make the water safer to drink? Anything else? [RECORD ALL ANSWERS MENTIONED]	1. Boil 2. Add bleach or chlorine 3. Strain through cloth 4. Use water filter (ceramic sand/composite/etc.) 5. Solar disinfection 6. Let it stand and settle 7. Buy purified water 8. Other (Specify: _____) 88. Don't know
Q7. We would like to learn about the places that households use to wash their hands. Can you please show me where members of your household most often wash their hands?	1. Observed, fixed place 2. Observed, mobile 3. Not observed, not in dwelling/yard/plot 4. Not observed, no permission to see 5. Not observed, other reason → SKIP TO Q10
Q8. PRESENCE OF WATER AT THE PLACE FOR HANDWASHING. RECORD OBSERVATION.	1. Water is available 2. Water is not available

Q9. PRESENCE OF SOAP, DETERGENT, OR OTHER CLEANSING AGENT AT THE PLACE FOR HANDWASHING. RECORD OBSERVATION	1. Soap or detergent (bar, liquid, powder, paste) 2. Ash, mud, sand 3. None
Q10. What kind of toilet facility do members of your household usually use? *[IF ANSWER 1 – 10:* - *CONFIRM BY OBSERVATION* - *ASK FOR PERMISSION TO TAKE A PHOTO OF THE TOILET FACILITY USED IN THE HOUSEHOLD.* - *CHANGE PHOTO NAME TO QUESTIONNAIRE ID#. IF THIS IS NOT POSSIBLE, RECORD NOTES BELOW TO CHANGE NAME LATER.]* *PHOTO DETAILS:* _____ _____ _____	1. Flush to piped sewer system 2. Flush to septic tank 3. Flush to pit latrine 4. Flush to somewhere else 5. Flush, don't know where 6. Ventilated improved pit latrine 7. Pit latrine with slab 8. Pit latrine without slab / open pit 9. Composting toilet 10. Bucket toilet 11. Hanging toilet / hanging latrine 12. No facility / bush / field → SKIP TO Q13 13. Use another household's latrine → SKIP TO Q13 14. Other (Specify: _____) [ANSWER ABOVE IS CONFIRMED BY OBSERVATION] 1. Observed 2. Not Observed [PHOTO TAKEN] 1. Yes 2. No
Q11. Do you share your toilet facility with other households?	1. Yes 2. No 88. Don't Know → SKIP TO Q13
Q12. How many other households use this toilet facility?	|___|___| Households 88. Don't Know
Q13. The last time your youngest child passed stools in the past 24 hours, what was done to dispose of the stools?	1. Child used toilet or latrine 2. Put / rinsed into toilet or latrine 3. Put / rinsed into drain or ditch 4. Thrown into garbage 5. Buried 6. Left in the open 7. Other (Specify:_____)
Q14. Does your family have an ID Poor Card? *[REQUEST TO SEE THE CARD]*	1. Yes, observed card 2. Yes, not observed card 3. Yes, expired card 4. No 88. Don't know

That concludes our interview. Thank you for your time and participation.

ANNEX D: DATA COLLECTION PROCESS AND QUALITY ASSURANCE

Data Collection Process

A local survey partner subcontracted by MSI, KHANA Center for Population Health Research, collected the baseline survey data and anthropometry measures, with close collaboration, supervision, and quality oversight provided by the evaluation team. The surveys were administered face to face at the eligible households. The survey took approximately 20 minutes to complete. The enumerators obtained oral informed consent from each respondent, prior to the start of the survey, to confirm that she was willing to participate and to consent to anthropometry measures of her child. KHANA provided a small gift (equivalent of USD $1.50) to respondents after the survey was completed as a token of appreciation. Prior to the start of data collection, the survey was piloted and enumerators were trained over the course of four days. Data quality assurance processes were put in place internally by KHANA, and also independently by the evaluation team.

Baseline protocols were reviewed and approved by the National Ethics Committee for Health Research in the Cambodian Ministry of Health. Baseline data collection was carried out in September 2016, with a team of 42 paired enumerators, 4 supervisors, an anthropometry specialist, a field coordinator, and the MSI local coordinator.

Data Quality Assurance

KHANA followed standard operating procedures for data collection, including verification procedures conducted both at the site and at headquarters in Phnom Penh, double entry of survey data, and data query. The survey firm employed the following set of quality control procedures during each data collection round:

- The field manager and supervisors constantly managed the workflow to ensure all enumerators followed the agreed timeline and procedures. The field manager was in consistent contact with the supervisors to find proper solutions to any unexpected challenges.
- Each supervisor reviewed all completed questionnaires on site, including reading through all questions and answers in the questionnaire to ensure that there were no blanks, skip mistakes, logical inconsistencies, etc. If the supervisor noticed missed questions, skipped questions, or unclear writing, questionnaires were marked and returned to interviewers.
- Supervisors accompanied at least 10 percent of the interviews conducted.
- The anthropometry specialist was present in the field during the entire baseline phase, accompanying enumerators to ensure proper technique with the height and weight measurements and recording.
- Completed and reviewed surveys were submitted to the data entry team, where an inspector reviewed each survey for completeness and adequacy prior to data entry.
- Double data entry was performed, where the second data entry was done without knowledge or cross reference to the first data entry. Any discrepancies between the two entries of data were resolved by a third person.
- Datasets and progress reports were submitted to the evaluation team on a weekly basis. The progress report included number of completed surveys and reasons for replacement.

The evaluation team provided additional oversight and monitoring during each data collection round:

- Accompaniments of enumerators during interviews at regular intervals. The local coordinator on the evaluation team observed the enumerators' familiarity with and comprehension of the questionnaire and clarity in asking questions. The local coordinator also ensured the protocols for random selection of households were properly followed.
- The local coordinator also conducted back-checks on 10 percent of completed surveys for each round. Surveys to be back checked were selected randomly and stratified by enumerator to ensure each one was checked on an equal basis. During the back-check call, several validation questions were asked, including confirmation of enumerator's visit, presence of eligible child, confirmation that length and weight measurements were taken, receipt of token, friendliness of the enumerator, respondent's level of school attendance, number of household members, total births, participation in CLTS activities, main source of drinking water, number of rooms in the dwelling, and ownership of a motorcycle or motor scooter. Only a few minor discrepancies were found. No back check resulted in significant variance from the reported data.
- From the remaining surveys that were not back checked, a random sample (5 percent) of the scanned paper surveys were compared with the database. This audit showed no meaningful data entry errors; minor discrepancies were fixed.
- Photographs of the household latrines were taken by each enumerator and tagged with the unique household identification number. A random sample (20 percent) of the photographs were cross-checked with the recorded survey answer to ensure proper classification. No discrepancies were found.
- Each week, the evaluation team conducted additional checks to compare each enumerator's average performance to the total sample averages in terms of interview length, number of completed codes, number of "do not knows," scale usage, section skips, and ranges of numerical values. No significant outliers were found.

ANNEX E: ANTHROPOMETRY PROTOCOLS

Anthropometric measurement is comprised of weight and length. Weight was measured using Uniscale (UNICEF recommended scale) in Kilogram with precision to one decimal point. Length was measured using a length board (UNICEF / WFP recommended) in Centimetre with precision to one decimal point. Two data measurements were required, one from the measurement taker and another one from an assistant. The measurement procedure followed FANTA Guidelines:[59]

- Weight measurement:
    - *Preparation*: Ensure enough material is available for measurement (scale, battery, pen, tissue, record form, and age calculation form) with proper function. Ensure that the scale is positioned in a plate and smooth surface. Measurement taker is on the right hand of mother/caregiver while assistant is in front of mother/caregiver. Ensure that children dress light clothes with no cap or shoes. Assistant helps mother/caregiver in carrying the child and asks mother/caregiver to go on to the scale after proper functioning.
    - *During Measurement*: Request mother/caregiver to stand on the scale, inform the measurement result loudly, press button to measure child, hand the child to mother/caregiver after scale functioning, read weight of child out loud so that assistant can record the measurement.
    - *Second Measurement*: Request mother/caregiver to step off the scale. Repeat the measurement steps. Record second measurement.

- Length measurement:
    - *Preparation*: Prepare length board on a plate and smooth surface. Ensure length board stability, take off shoe and cap from child. Check measurement level on the length board, and ensure the record form.
    - *During Measurement*: Lay child on his back on the board, check head, eye, shoulder, hand, buttock, knees and heel. Make sure body is in proper position and still. Measurement must be read to the nearest of 0.1 cm. Repeat the measurement one more time to ensure accuracy of reading. If the two measurements are different by more than 1.0 cm, then a third measurement is taken.

- Following the weighing and length measurements, any child who is classified as severely malnourished is referred to the health clinic.

[59] Bruce Cogill, "Anthropometric Indicators Measurement Guide," (2003).

ANNEX F: REFERENCES

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