Global Scaling Up Handwashing Project

Scaling Up Handwashing Behavior:

Findings from the Impact Evaluation Baseline Survey in Vietnam

Claire Chase and Quy-Toan Do

November 2010

wsp
water and
sanitation program

The Water and Sanitation Program is a multi-donor partnership administered by the World Bank to support poor people in obtaining affordable, safe, and sustainable access to water and sanitation services.

Claire Chase
Water and Sanitation Program

Quy-Toan Do
The World Bank

Global Scaling Up Handwashing is a Water and Sanitation (WSP) project focused on applying innovative behavior change approaches to improve handwashing with soap behavior among women of reproductive age (ages 15–49) and primary school-age children (ages 5–9). It is being implemented by local and national governments with technical support from WSP in four countries: Peru, Senegal, Tanzania, and Vietnam. For more information, please visit www.wsp.org/scalinguphandwashing.

This Technical Paper is one in a series of knowledge products designed to showcase project findings, assessments, and lessons learned in the Global Scaling Up Handwashing Project. This paper is conceived as a work in progress to encourage the exchange of ideas about development issues. For more information, please email Claire Chase at wsp@worldbank.org or visit www.wsp.org.

WSP is a multi-donor partnership created in 1978 and administered by the World Bank to support poor people in obtaining affordable, safe, and sustainable access to water and sanitation services. WSP's donors include Australia, Austria, Canada, Denmark, Finland, France, the Bill & Melinda Gates Foundation, Ireland, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States, and the World Bank.

WSP reports are published to communicate the results of WSP's work to the development community. Some sources cited may be informal documents that are not readily available.

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Acknowledgements

An integral component of the Water and Sanitation Program's Global Scaling Up Handwashing Project, a cross-country impact evaluation (IE) study is being conducted in Peru, Senegal, Tanzania, and Vietnam. The World Bank's Water and Sanitation Program (WSP) Global Impact Evaluation Team in Washington, DC, leads the study, with the contribution of WSP teams and consultants in each of the participating countries. The baseline data collection for all countries was conducted during 2008 and 2009, and the reports have undergone several peer review processes.

The handwashing project's Global Impact Evaluation Team oversees the impact evaluation design, methodology, and country teams. It is led by Bertha Briceno (in its early stages the Global IE was led by Jack Molyneaux), together with Alexandra Orsola-Vidal and Claire Chase. Professor Paul Gertler has provided guidance and advice throughout the project. Global IE experts also include Sebastian Galiani, Jack Colford, Ben Arnold, Pavani Ram, Lia Fernald, Patricia Kariger, Paul Wassenich, Mark Sobsey, and Christine Stauber. At the country level, the Vietnam Impact Evaluation Team, led by principal investigator Claire Chase with advisory assistance of Quy-Toan Do, manages the in-country design, field activities, and data analysis.

The Vietnam impact evaluation also benefits from continuous support from Eduardo Perez, the global task team leader for the handwashing project; Nga Kim Nguyen, country task manager for the handwashing project in Vietnam; Minh Thi Hien Nguyen, country monitoring & evaluation officer; and the global technical team comprised of Hnin Hnin Pyne, Jacqueline Devine, Nathaniel Paynter, and the Water and Sanitation Program support staff.

The baseline survey was conducted by the National Institute of Hygiene and Epidemiology in Hanoi with management oversight from Dr. Tham Chi Dung, acting chief, under the overall direction of Dr. Nguyen Tran Hien, director. A cadre of survey enumerators at the provincial, district, and commune administrative levels provided support. Photographs courtesy of WSP, Claire Chase, and Tham Chi Dung.

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Executive Summary

Background

In December 2006, in response to the preventable threats posed by poor sanitation and hygiene, the Water and Sanitation Program (WSP) launched Global Scaling Up Handwashing and Global Scaling Up Rural Sanitation[1] to improve the health and welfare outcomes for millions of poor people. Local and national governments implement these large-scale projects with technical support from WSP.

Handwashing with soap at critical times—such as after contact with feces and before handling food—has been shown to substantially reduce the incidence of diarrhea. It reduces health risks even when families do not have access to basic sanitation and water supply. Despite this benefit, rates of handwashing with soap at critical times are very low throughout the developing world.

Global Scaling Up Handwashing aims to test whether handwashing with soap behavior can be generated and sustained among the poor and vulnerable using innovative promotional approaches. The goal of Global Scaling Up Handwashing is to reduce the risk of diarrhea and therefore increase household productivity by stimulating and sustaining the behavior of handwashing with soap at critical times in the lives of 5.4 million people in Peru, Senegal, Tanzania, and Vietnam, where the project has been implemented to date.

In an effort to induce improved handwashing behavior, the intervention borrows from both commercial and social marketing fields. This entails the design of communications campaigns and messages likely to bring about desired behavior changes and delivering them strategically so that the target audiences are "surrounded" by handwashing promotion via multiple channels.

One of the handwashing project's global objectives is to learn about and document the long-term health and welfare impacts of the project intervention. To measure magnitude of these impacts, the project is implementing a randomized-controlled impact evaluation (IE) in each of the four countries to establish causal linkages between the intervention and key outcomes. The IE uses household surveys to gather data on characteristics of the population exposed to the intervention and to track changes in key outcomes that can be causally attributed to the intervention.

Vietnam Intervention

In Vietnam, the handwashing project is carried out in 540 communes across 56 districts in 10 provinces. Underway since 2006, Phase 1 of the intervention has reached a total of 1.8 million people. Phase 2 of the intervention aims to reach an additional 30 million people through interpersonal communication (IPC), community marketing events, and mass media, and is being evaluated through a randomized-controlled impact evaluation.

This technical paper describes the baseline findings from Vietnam, and is part of a series of technical reports summarizing baseline findings from similar surveys conducted in each of the Scaling Up project countries.

Methodology and Design

The Vietnam Scaling Up Handwashing IE baseline survey collected information from a representative sample of the population targeted by the intervention. The survey was conducted between September and November 2009 in a total of 3,150 households containing 3,751 children under the age of five. The survey results provide information on the characteristics of household members, access to handwashing facilities, handwashing behavior, prevalence of child diseases such as diarrhea and respiratory infection, and child growth and development. In addition, community questionnaires were conducted with key informants at the village level in all sample locations to gather information on community access to transportation; commerce; health and education facilities, and other relevant infrastructure; contemporaneous health and development interventions; and environmental and health shocks.

Summary of Findings

Handwashing behavior

The baseline findings in Vietnam in regards to handwashing behavior suggest that there is still a need to improve handwashing with soap practices in the target population, particularly among the poorest. Some of the key times during which handwashing should take place are not at the top of the mind for caretakers of young children, since less than one-third reported handwashing with soap after cleaning a

[1] For more information on Global Scaling Up Rural Sanitation, see www.wsp.org/scalingupsanitation.

child's bottom and before cooking or preparing food, and just around one-third before feeding children. While a little over 80 percent of households have a place for handwashing with soap and water present, the poorest households are 23 percent less likely to have access to a place for handwashing. Moreover, the place for handwashing is more often located inside the toilet facility or food preparation area in wealthier households (55.1 percent) as opposed to the poorest (10.0 percent). The handwashing place was observed to be more than three meters from the toilet or food preparation area in 31.6 percent of the poorest households.

Water and soap were generally available in the households sampled, creating a suitable environment for improved handwashing behavior. In 98.0 percent of households, water was observed at the place used for washing hands after going to the toilet, and at least one type of soap was present at the place for washing hands in close to 94 percent of households. The type of soap most commonly found in the household regardless of wealth was powdered soap, such as laundry soap or detergent, and an average of 61.9 percent of households had this type of soap present at the place indicated for washing hands.

Child health and development

Over the past decade Vietnam has made significant strides in poverty reduction and is on track to achieve nearly all of the Millennium Development Goals (MDGs) by 2015, in particular those relating to child undernutrition.[2] This progress is reflected in the baseline findings presented here, where indicators of child health are largely positive and indicative of an overall healthy child population. Whereas estimates from the 2002 Vietnam Demographic and Health Survey and third round of the 2006 Multiple Indicator Cluster Survey reported prevalence of diarrhea among children under five of 11.0 percent and 6.8 percent respectively, the findings in relation to caregiver-reported diarrhea for this sample of children under five is around 1.0 percent. Similarly, caregiver-reported ALRI prevalence is just 0.7 percent. Importantly, these caregiver-reported illness symptoms are internally consistent with the child growth measures and anemia prevalence found in the sample population, both of which provide more objective measures of child health than caregiver-reported diarrhea and respiratory illness.

Despite these positive findings, there are still key differences found in child health outcomes by household wealth status, with the poor being consistently worse off. Nearly one-fifth of the children under two in the sample are stunted in the poorest households, and over 10 percent are malnourished in the two lowest wealth quintiles. Moreover, children from households in the lowest wealth quintile exhibit lower weight-for-age (–0.90 SDs lower than median) and length-for-age (–0.96 SDs lower than median) on average. Finally, presence of anemia as measured by hemoglobin concentration is 31.7 percent in all children sampled, while it is slightly higher at 35.5 percent in the lowest wealth quintile, suggesting an inverse association between anemia and household wealth.

The structure of this report proceeds as follows: In Chapter 1 we provide an overview of the Global Scaling Up Handwashing and Global Scaling Up Rural Sanitation projects, as well as background on the handwashing project in Vietnam. Chapter 2 details the methodology that underlies the impact evaluation, and provides details on the sampling design, sample selection, and field work protocols. The baseline findings for general household characteristics, handwashing behavior, child health, and child growth are presented in depth in Chapter 3. In Chapter 4 we conclude with a summary of the next steps of the impact evaluation study.

[2] United Nations Development Program. 2010. *Achieving the Millennium Development Goals in an Era of Global Uncertainty: Asia-Pacific Regional Report 2009/10.* Bangkok, Thailand: United Nations.

Abbreviations and Acronyms

ALRI	Acute Lower Respiratory Infection
C	Control
DCC	Direct Consumer Contact
Hb	Hemoglobin
HH(s)	Household(s)
HW	Handwashing
HWWS	Handwashing with Soap
IE	Impact Evaluation
IPC	Interpersonal Communication
IV	Intravenous Fluid Injection
M&E	Monitoring and Evaluation
MICS	Multiple Indicator Cluster Survey
MDG	Millennium Development Goals
NGO	Nongovernmental Organization
NIHE	National Institute of Hygiene and Epidemiology
ORS	Oral Rehydration Solution
PCA	Principal Components Analysis
T1	Treatment 1
T2	Treatment 2
USD	United States Dollars
VND	Vietnamese *Dong*
VNDHS	Vietnam Demographic and Health Survey
VWU	Vietnam Women's Union
WHO	World Health Organization
WSP	Water and Sanitation Program

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I. Overview

1.1 Introduction

In response to the preventable threats posed by poor sanitation and hygiene, in December 2006 the Water and Sanitation Program (WSP) launched two large-scale projects, Global Scaling Up Handwashing and Global Scaling Up Rural Sanitation, to improve the health and welfare outcomes for millions of poor people. Local and national governments are implementing these projects with technical support from WSP. The goal of the Global Scaling Up Handwashing project is to reduce the risk of diarrhea and therefore increase household productivity by stimulating and sustaining the behavior of handwashing with soap at critical times in 5.4 million people in Peru, Senegal, Tanzania, and Vietnam. On average, the project will improve the handwashing behavior of over one million people per country.

Handwashing with soap at critical times (such as after contact with feces and before handling food) has been shown to substantially reduce the incidence of diarrhea. It reduces health risks even when families do not have access to basic sanitation and water supply service. Despite this known benefit, rates of handwashing with soap at critical times are very low throughout the developing world.

The project aims to test whether improved handwashing behavior at critical times can be generated among the poor and vulnerable using innovative promotional approaches. In addition, it will undertake a structured learning and dissemination process to develop the evidence, practical knowledge, and tools needed to effectively replicate and scale up future handwashing programs.

WSP's vision of success is that the project will have demonstrated that handwashing with soap, at scale, is one of the most successful and cost-effective interventions to improve and protect the health of poor rural and urban families, especially children under the age of five. Moreover, the project seeks to develop the evidence, practical knowledge, and tools for effective replication and scaling up of future handwashing programs, potentially reaching more than 250 million people in more than 20 countries by 2020.

The handwashing project's global activities test innovative approaches at scale, with the following four main objectives:

- Design and support the implementation of innovative, large-scale, sustainable handwashing programs in four diverse countries (Peru, Senegal, Tanzania, and Vietnam).
- Document and learn about the impact and sustainability of innovative large-scale handwashing programs.
- Learn about the most effective and sustainable approaches to triggering, scaling up, and sustaining handwashing with soap behaviors.
- Promote and enable the adoption of effective handwashing programs in other countries and—through the translation of results and lessons learned—position handwashing as a global public health priority through effective advocacy and applied knowledge and communications products.

The handwashing project also aims to complement and improve on existing hygiene behavior change and handwashing approaches, and to enhance them with novel approaches—including commercial marketing—to deliver handwashing with soap messages, along with broad and inclusive government partnerships of government, private commercial marketing channels, and concerned consumer groups and nongovernmental organizations (NGOs). These innovative methods will be combined with proven community-level interpersonal communication and outreach activities, with a focus on sustainability. In addition, the project incorporates a rigorous impact evaluation component to support thoughtful and analytical learning, combined with effective knowledge dissemination and global advocacy strategies.

As reflected above, the process of learning, which is supported in the project's monitoring and evaluation components, is considered critical to the project's success. As part of these efforts, the project will document the magnitude of health impacts and relevant project costs of the interventions. To measure impact, the project is implementing a randomized-controlled trial impact evaluation (IE) of the handwashing project in the four countries, using household surveys to measure the levels of key outcome indicators.

This report is part of a series presenting the analysis of baseline data collection conducted in the implementation countries during 2008 and 2009.

Global Scaling Up Project Impact Evaluation Rationale and Aims

The overall purpose of the IE is to provide decision makers with a body of rigorous evidence on the effects of the handwashing and sanitation projects at scale in reference to a set of relevant outcomes. It also aims to generate robust evidence on a cross-country basis, understanding how effects vary according to each country's programmatic and geographic contexts and generating knowledge of relevant impacts such as child growth and development, child illness, and productivity of mother's time, among others.

The studies will provide a better understanding of at-scale sanitation and hygiene interventions. The improved evidence will support development of policies and programs, and will inform donors and policy makers on the effectiveness and potential of the Global Scaling Up projects as large-scale interventions to meet global needs.

1.2 Project Background

In Vietnam, the handwashing project targets mothers and caregivers of children under five years old, and is aimed at improving handwashing with soap practices. Children under five represent the age group most susceptible to diarrheal disease and acute lower respiratory infections, which are two major causes of childhood morbidity and mortality in less developed countries. These infections, usually transferred from dirty hands to food or water sources, or by direct contact with the mouth, can be prevented if mothers and caregivers wash their hands with soap at critical times (such as before feeding a child, cooking, or eating, and after using a toilet or contact with a child's feces).

In an effort to induce improved handwashing behavior, the intervention borrows from both commercial and social marketing fields. This entails formative research on barriers to handwashing with soap, the design of communications campaigns and messages likely to bring about the desired behavior changes, and the strategic delivery of messages so that the target audience is "surrounded" by

A young Vietnamese child

handwashing promotion. Some key elements of the intervention include:

- Key behavioral concepts or triggers for each target audience
- Persuasive arguments stating why and how a given concept or trigger will lead to behavior change, and
- Communications ideas to convey the concepts through many integrated activities and communication channels.

1.3 Project Components

The overall objective of the project is to improve the health of populations at risk for diarrhea and acute lower respiratory infections, especially children under five years old, through a strategic communications campaign aimed at increasing handwashing with soap behavior at the critical times.

In Vietnam, the handwashing project has been underway since 2006 in a total of 540 communes across 56 districts in 10 provinces. Phase 1 of the handwashing project, which was funded by the Danish Embassy and had an estimated reach of 17 million through mass media, direct consumer contact, and interpersonal communication, ended in September 2008. Phase 2 of the project,

funded by the Bill and Melinda Gates Foundation, took place between May 2008 and June 2009 and has reached an estimated 650,000 through mass media and interpersonal communication activities. The third and final phase (Phase 3) of the handwashing project, with continued funding from the Bill and Melinda Gates Foundation, aims to reach an additional 17 million through interpersonal communication, mass media, and direct consumer contact. This phase is being evaluated using a randomized-controlled trial impact evaluation.

The handwashing project in Vietnam uses a behavior change approach to address barriers to effective handwashing among the target population. Communications activities focus on the importance of handwashing with soap by caretakers for the health and development of young children; the need to wash hands with soap immediately before cooking or eating, before feeding a child, and after using the toilet; and the need to make soap available at a water source. The target population for the intervention is mothers and other caretakers age 15 to 49, and children from 6 to 12 years of age.[3]

The IE seeks to evaluate two distinct combinations of the following three components of Phase 3 of the program:

- **Component 1—Interpersonal Communication (IPC) Activities:** with technical support from the WSP, the Vietnam Women's Union (VWU) is implementing an extensive training program for village health workers, teachers, and Women's Union members in how to promote group and household level IPC activities that reinforce handwashing with soap behavior in the target population. In total, over 14,000 front-line workers have been trained as handwashing motivators to carry out the IPC activities in their communities. These IPC activities include group meetings with mothers and other caretakers of children under five, group meetings with women ages 18–49, group meetings with grandparents, household visits, market meetings, Women's Union club meetings, and handwashing with soap festivals, among others.

[3] A school-based handwashing campaign carried out by the project targeting children 6 to 10 years of age is not part of the impact evaluation.

Vietnam Women's Union members teach women to wash hands with soap in the market

- **Component 2—Direct Consumer Contact (DCC) Activities:** Rooted in the communications objectives of the handwashing project, this component reinforces the IPC components of the implementation by integrating commercial marketing events, or DCC, and social marketing of handwashing with soap. The DCC events use education and entertainment as the primary means of communicating handwashing with soap messages through skits, songs, dances, and question and answer sessions to reinforce the messages delivered through the IPC activities and mass media. These events also provide an opportunity for the campaign to distribute physical reminders (including promotional flyers, soap samples, and handwashing campaign branded hand clappers and hats) to participants to wash hands with soap.
- **Component 3—Mass Media Campaign:** The WSP, in collaboration with various national and provincial television stations is launching several mass media campaigns throughout the life of the project, including a large scale campaign scheduled to roll out from March 2010 to January 2011. The mass media campaign features television spots carried out on a national scale across ten channels. The frequency of

the spots will vary over time in an effort to reach the target audience as often as possible.

One experimental arm of the IE will evaluate the impact of IPC and mass media (components 1 and 3), while the other experimental arm will evaluate the combination of IPC, DCC, and mass media (components 1, 2, and 3). Both experimental arms will be measured against a control arm that will benefit from handwashing messages via national mass media, but that will not be exposed to either IPC or DCC activities promoting handwashing with soap.

1.4 Objectives of the Study

The objective of the IE is to assess the effects of the handwashing project on individual-level handwashing behavior and practices of caregivers. By introducing exogenous variation in handwashing promotion (through randomized exposure to the project), the IE will also address important issues related to the effect of intended behavioral change on child development outcomes. In particular, it will provide information on the extent to which improved handwashing behavior contributes to child health and welfare.

The primary hypothesis of the study is that improved handwashing behavior leads to reductions in disease incidence, and results in direct and indirect health, developmental, and economic benefits by breaking the fecal-oral transmission route. The IE aims to address the following research questions and associated hypotheses:

1. What is the effect of handwashing promotion on handwashing behavior?
2. What is the effect of improved handwashing behavior on health and welfare?
3. Which promotion strategies are more cost-effective in achieving desired outcomes?

The purpose of this report is to provide baseline descriptive information on the selected indicators included in the survey.

II. Methodology

2.1 Randomization

To address the proposed research questions, a proper IE methodology is needed to establish the causal linkages between the handwashing project and the outcomes of interest. In order to estimate the causal relationship between the handwashing project (treatment) and the outcomes of interest, a counterfactual is required—in other words, a comparison group that shows what would have happened to the target group in the absence of the intervention.

Random assignment of treatment, whereby a statistically random selection of communities receives the treatment and the remaining serve as controls, generates a robust counterfactual to measure the causal effect of the intervention. The randomization process ensures that on average the treatment and comparison groups are equal in both observed and unobserved characteristics,[4] and that an appropriate counterfactual can be measured. A randomized experimental evaluation with such a comparison group is valuable because it reduces the possibility that observed changes in outcomes in the intervention group are due to factors external to the intervention.

In the context of this evaluation, where implementation spans nine months, it is possible that factors such as weather, macro-economic shocks, disease outbreaks, or other new and ongoing public health, nutrition, sanitation, and hygiene campaigns, for example, could influence the same set of outcomes that are targeted by the handwashing project (e.g., diarrhea prevalence in young children, health, and welfare). If no control group is maintained and a simple pre- to post-assessment is conducted of the handwashing project, the observed changes in outcomes cannot be causally attributed to the intervention.

Random assignment of treatment helps to prevent additional problems that affect our certainty that the observed changes in outcomes are due to the intervention. In many cases, communities chosen for programs such as the handwashing project are selected precisely due to the high likelihood of their success due to favorable local conditions (strong leadership, existing water and sanitation infrastructure, highly educated population, etc.), and are likely to be systematically different from areas that are less desirable for implementation. If random assignment is not used, a comparison of treated and untreated areas would confuse the program impact with pre-existing differences between communities, such as different hygiene habits, lower motivation, or other factors that are difficult to observe. This is known as *selection bias* in economics and *confounding bias* in the health sciences.[5] Random assignment of treatment avoids these difficulties, by ensuring that the communities selected to receive the intervention are no different on average than those that are not. A detailed comparison of means between the treatment and control groups on an exhaustive list of covariates is provided in Annex 2.

2.2 Study Design

To assess the impact of each component of the handwashing project on the health of children under five, the evaluation will have two treatment arms. Treatment 1 (T1) comprises the IPC and mass media campaign components, and Treatment 2 (T2) comprises the IPC, DCC and mass media campaign components. As mentioned previously, in order to measure the health and developmental impact of each component, a counterfactual to T1 and T2 is needed, which we will refer to as the Control (C). The design allows us to investigate the impact of both T1 and T2 (relative to the control). Each group, T1, T2, and C, comprises a representative sample of the population of households with at least one child under the age of two at baseline.

[4] Technically, this is only true with infinite sample sizes, which is unaffordable and unnecessary. Instead, this study seeks to minimize the risk that the means of the treatment and comparison groups differ significantly. For details of mean comparison tests across treatment and control groups, please see Annex 2: Baseline Balance Comparison of Means Tests.

[5] Hernan 2004.

2.3 Sampling Strategy and Sample Size

The primary objective of the handwashing project is to improve the health and welfare of young children. Thus, a sufficient sample size was calculated to capture a minimum effect size of 20 percent on the key outcome indicator of diarrhea prevalence among children under two years old at the time of the baseline. By focusing on households with children under two, the evaluation aims to capture changes in outcomes for the age range during which children are most sensitive to changes in hygiene in the environment. Power calculations indicated that approximately 1,050 households per treatment arm would need to be surveyed in order to capture a 20 percent reduction in diarrhea prevalence, and in order to account for the possibility of household attrition during the project study phase. Therefore, since the evaluation consists of two treatment groups and one control group, the total sample incorporates 3,150 households, each of which has at least one child under two years of age at the time of the survey.

Rather than using simple random sampling, which is much more costly, the study randomly sampled households in clusters at the commune administrative level. Households were randomly selected from a sampling frame of 210 communes randomly selected from 15 districts in three provinces. Data were collected using structured questionnaires in all 3,150 households and in each of the 210 communes (one per commune). Further details on the selected list of districts and communes can be found in Annex 1.

In total, 401 communes across 18 districts in the three project provinces were listed by the VWU as eligible to participate in the project. From this list a total of 210 communes[6] across 15 districts in the three provinces were selected for the study (as shown in Map 1) using the following three-stage design:

- **Stage 1: District Selection**
  District selection was not randomized, but was instead discussed and agreed upon with VWU at center and provincial administrative levels. The criteria for district selection were:
  - Districts with a large population
  - Districts that have not participated in large hygiene programs, particularly in handwashing, over the past five years, and
  - Districts with the willingness, commitment, and capacity of VWU staff to carry out the planned activities.

  From the list of 18 eligible districts provided by the VWU, a total of 15 were selected to participate in the experimental phase of the handwashing project. These included five districts from the province of Hung Yen, four districts from Thanh Hoa, and six districts from Tien Giang.
- **Stage 2: Commune Selection**
  Within the 15 selected districts a total of 315 communes were used as the sampling frame. The sample was first stratified by province to account for regional variation between the provinces. Within each province, communes were matched into groups of three so as to minimize the statistical distance between the so as to minimize statistical distance between the three communes based on covariates of population size, number of households, and geographic location (coastal, flat, or mountainous area). A total of 70 groups of three were then randomly selected into the study (Hung Yen = 24; Thanh Hoa = 20; Tien Giang = 26). Finally, the communes in each group of three were randomly assigned to one of the three treatment groups, T1, T2, or C. A total of 70 communes were assigned to T1, 70 to T2, and 70 to control.
- **Stage 3: Household Selection**
  Approximately one month prior to fieldwork a list was obtained from the commune health station. It contained all households with a child younger than the age of two. A random sample of 15 households was drawn at the time of the survey in each commune. Each household contained at least one child between the age of 0 and 24 months at the time of listing. An additional 10 replacement households were randomly selected at the time of the survey to accommodate households that refused to participate in the survey. Households in which specially trained community motivators lived were excluded from the sample, since these volunteers would later play a role in delivering handwashing project messages to the community.

[6] The remaining 191 communes were not part of the evaluation sample and will not receive the IPC or DCC handwashing project interventions, but will be exposed to handwashing messages via national-level mass media.

MAP 1: GEOGRAPHIC REPRESENTATION OF COMMUNES SELECTED FOR HANDWASHING PROJECT IMPACT EVALUATION

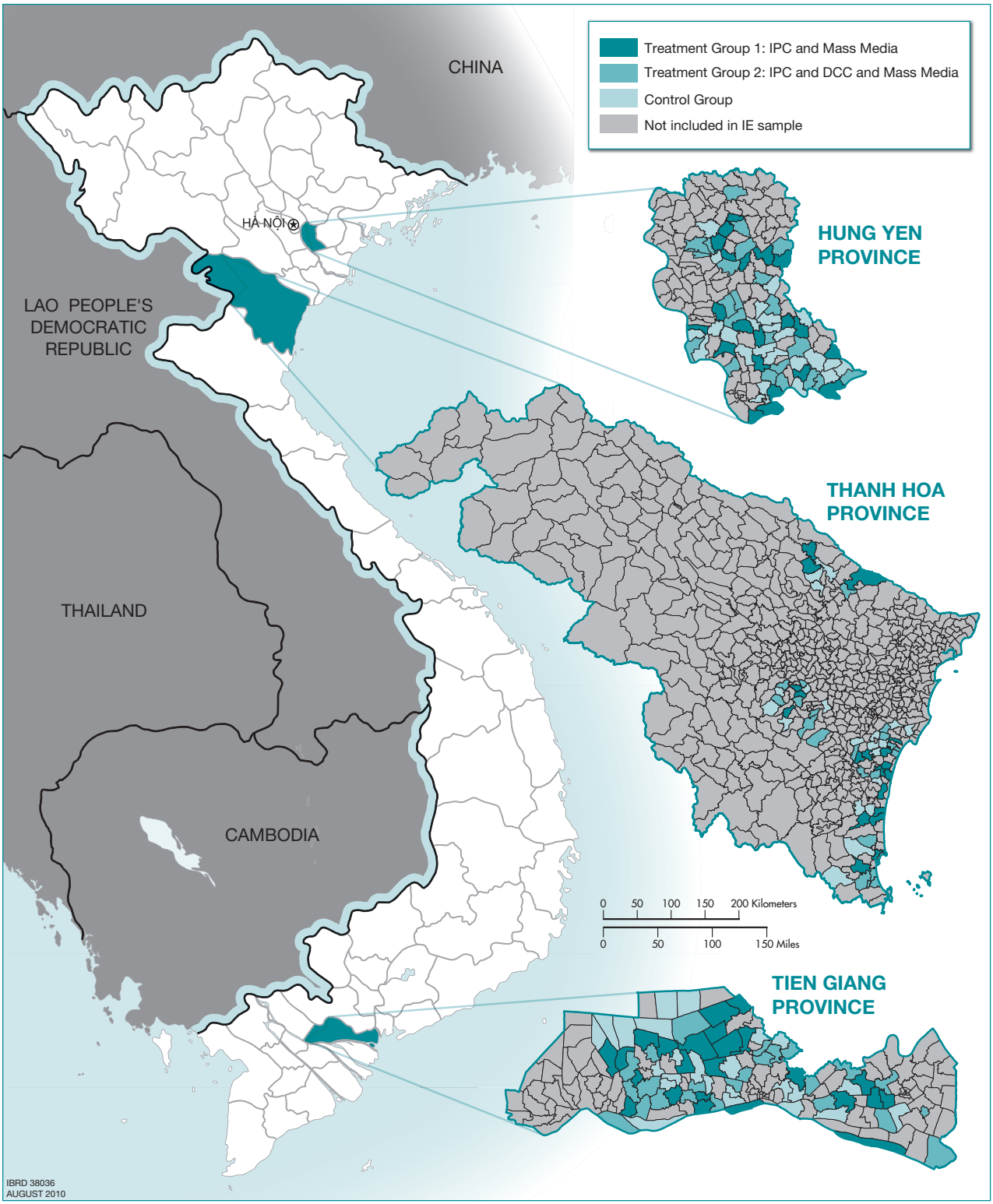
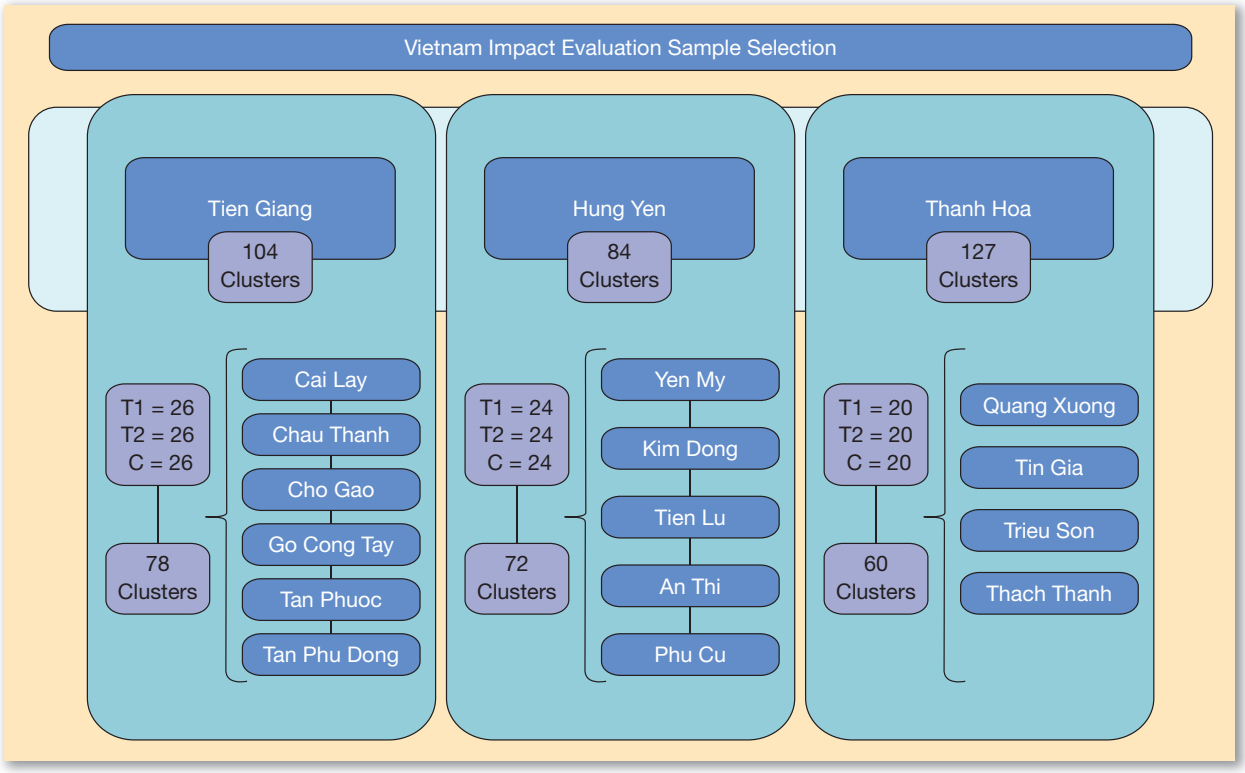


FIGURE 1: VIETNAM IMPACT EVALUATION SAMPLE SELECTION



This sample selection process is illustrated in Figure 1. Further details on the selected list of districts and communes can be found in Annex 1.

2.4 Variables for Data Analysis

The IE aims to assess both the effect of project on handwashing behavior and the effect of handwashing on child health and welfare. In order to measure potential impacts of the intervention, the study will collect data on child illness, nutrition, child growth and development, anemia, productivity, education, environmental contamination,[7] and handwashing behavior and its determinants.

[7] Environmental contamination as measured by water samples will be collected during the post-intervention follow-up survey.

The above variables are collected through three different surveys: the *baseline* survey, collected before the intervention and reported on here; a *longitudinal* survey, collected a total of three times prior to the intervention; a *mid-term monitoring* survey, collected three to six months after the intervention began; and a *post-intervention* survey, to be collected after the intervention is complete.

Box 1 and Box 2 summarize the variables measured and how measurements were performed.

2.5 Instruments for Data Collection

The baseline survey was conducted from September to December 2009 and included the following instruments:

- **Household questionnaire**: The household questionnaire was conducted in all 3,150 households to

BOX 1: HEALTH AND WELFARE IMPACTS

What Does the Evaluation Measure?	How Is It Being Measured?	Measuring Instrument
Diarrhea prevalence	Caregiver reported symptoms collected in a 14-day health calendar	Household questionnaire
Productivity of mother's time	Time lost to own and child's illness	Household questionnaire
Education benefits	School enrollment and attendance	Household questionnaire
Child growth	Anthropometric measures:[8] - Weight - Height - Arm and head circumference	In-household collection of anthropometric (child growth) measures
Anemia	Hemoglobin concentration (< 110g/L per international standards)[9]	In-household collection and analysis of capillary blood using the HemoCue photometer

BOX 2: HANDWASHING BEHAVIOR AND DETERMINANTS

What Does the Evaluation Measure?	How Is It Being Measured?	Measuring Instrument
Handwashing with soap behavior	Direct observation of place for handwashing stocked with soap and water	Household questionnaire
	Self-reported handwashing with soap behavior	Household questionnaire
Determinants to handwashing with soap behavior[10]	Opportunity, ability, and motivation determinants	Household questionnaire

collect data on household composition, education, labor, income, assets, spot-check observation of handwashing facilities, handwashing behavior, and handwashing determinants.

- **Health questionnaire**: The health questionnaire was conducted in all 3,150 households, to collect data on children's diarrhea prevalence, acute lower respiratory infection (ALRI) and other health symptoms, child development, child growth, and anemia.
- **Community questionnaire**: The community questionnaire was conducted in 210 communes, to collect data on socio-demographics of the

[8] Habicht 1974.

[9] Stoltzfus and Dreyfus 1999.

[10] The analysis of the determinants of handwashing with soap behavior is not included in this report.

Enumerators cross a bridge in Tien Giang province for a household interview

community, accessibility and connectivity, education and health facilities, water and sanitation related facilities and programs, and government assistance or programs related to health, education, cooperatives, agriculture, water, and other development schemes.

A total of three pre-intervention longitudinal surveys and one mid-term monitoring survey will be conducted during the study. The post-intervention follow-up survey will be conducted from November 2010 to January 2011 and will collect data on all the indicators collected during the baseline survey, plus dwelling characteristics, water sources, drinking water, sanitation, exposure to health interventions, and mortality.

The survey instrument was drafted by the WSP global impact evaluation team, a group of experts from different disciplines. The complete instrument, which included a set of household, community and longitudinal questionnaires, was translated into Vietnamese, underwent back-translation into English, and the final version was pre-tested prior to use in the baseline survey. Questionnaires were administered to respondents in Vietnamese by native speakers.

Hemoglobin concentrations were measured in children under two years of age at the household level using the HemoCue Hb201 photometer, a portable device that allows for immediate and reliable quantitative results. Using sterile and disposable lancets (pricking needle), a drop of capillary blood was obtained from the child's second or third finger and collected in a cuvette, and then introduced into the HemoCue machine. Hemoglobin concentration appeared in the display screen of the device in about one minute, and results were transferred to the questionnaire. Anthropometric measures were made according to standardized protocols using portable infantometers, scales and measuring tape.[11]

2.6 Field Protocols

The National Institute of Hygiene and Epidemiology (NIHE) was contracted to conduct the field work for the baseline survey. With support from the principal investigator and the global IE team, NIHE researchers trained field supervisors and enumerators on all data collection protocols and instruments and were in charge of standardization of anthropometric and anemia measures.

Each field survey team consisted of one province level staff, two district level staff, and one to two commune-level staff. There were a total of 15 survey teams, one per district. Province-level staff served as supervisors and oversaw quality control of the interviews. District-level staff included one health staff in charge of interviewing the household, and one laboratory staff in charge of child anthropometric and hemoglobin concentration measurements, as well as backstopping the primary interviewer. One to two commune-level health staff/nurses were recruited from each commune to assist in anthropometric measurements and to receive training on the child health calendar for administration of the longitudinal survey. Three field managers from NIHE oversaw the work in each province.

[11] Habicht 1974.

III. Findings

In this section, we present summary descriptive statistics for key demographic, socioeconomic, hygiene, health, and child development variables. Findings are cross tabulated by household wealth quintile and province, and for outcomes of interest such as child growth measures, diarrhea, and ALRI in relation to access to a place for handwashing. The cross tabulations are valuable for understanding relationships between study outcomes and socioeconomic, geographic, and environmental characteristics of the household, and can help generate hypotheses regarding important factors to child health and development.

3.1 General Household Characteristics

Table 1 shows a brief summary of basic household socioeconomic characteristics. We find that the average household (HH) comprises 4.6 individuals and that a male heads 86.7% of households. The head of household is 42 years of age on average, with the proportion completing primary school 83.3%. The household head is employed in 85.8% of households with an average monthly income of 1.06 million Vietnamese *dong* (VND), equivalent to US$57[12]), which varies highly across household heads (3.51 million VND). Other household members are, on average, much younger (19.1 years old) and slightly smaller percentages have completed primary school education (81%). Three-quarters of the other members of the household are employed and earning an average monthly income of 670,000 VND (US$36), but this income is highly variable among households. Household income per capita is slightly lower than the average income of the household head, at 1.02 million VND.

The following tables provide a more detailed analysis of the socio-demographic and socioeconomic characteristics of the household by wealth quintile. Table 2 presents the age distribution of household members and household size by wealth quintile. Little difference is found across wealth quintiles at the younger ages; however, households in the higher wealth quintiles contain a higher proportion of individuals over 45, and most noticeably over 50 (16.2% in the

A household interview takes place in Tien Giang province

TABLE 1: SUMMARY STATISTICS

	Mean	Standard Deviation
HH size	4.6	1.2
HH Head:		
HH head is male (% HH heads)	86.7%	—
Age	42.2	15.1
HH head completed primary school education (% HH heads)	83.3%	—
HH head is employed (% HH heads)	85.8%	—
Labor income in VND (millions)	1.06	3.51
Other HH Members:		
Age	19.2	18.2
Other HH member completed primary school education (% other HH members)	81.0%	—
Other HH member is employed (% other HH members)	75.4%	—
Labor income in VND (millions)	0.67	2.19
HH per capita income (in VND)	1.02	4.59

[12] The US dollar-Vietnamese *dong* exchange rate of 18,544 VND per US$1 was provided by the Vietnam Central Bank as of April 23, 2010.

wealthiest quintile, compared to 8.3% in the poorest quintile). Older individuals may contribute to higher human capital in the household, leading to more wealth attainment, measured by the asset index in this study. On average, poorer households contain a larger proportion of younger members. More specifically, there is approximately a five percentage-point difference between the poorest and wealthiest quintile in terms of the number of children younger than five. This is further demonstrated by the higher than average number of children younger than five per household in the lowest quintile, 1.24, compared with the overall average of 1.19. Both household heads and other members of the household are younger on average in these poorer households.

Table 3 presents the percent distribution of education for individuals age five years and older. Education is an important socioeconomic indicator, closely associated with household income, child health status, and in the case of the handwashing intervention, may be related to the receptiveness to the communications messages of improved handwashing behavior. Educational attainment is high in Vietnam, achieving around 100% gross primary enrollment[13] in 2008, according to the

[13] The ratio of primary school enrollment to the number of primary school-age children (usually children ages 6–11). This figure can be greater than 100% if enrolled children are older or younger than the corresponding age group.

Households with children under age two were included in the survey

TABLE 2: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE HOUSEHOLD

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Age:						
0–4	29.2%	26.2%	25.1%	24.7%	24.2%	25.8%
5–9	7.7%	7.1%	7.0%	6.6%	6.0%	6.8%
10–14	4.4%	4.6%	3.6%	3.3%	3.4%	3.9%
15–19	2.7%	3.1%	3.6%	2.7%	2.8%	3.0%
20–24	9.7%	9.7%	9.6%	10.0%	7.5%	9.3%
25–29	15.5%	16.4%	16.6%	15.2%	15.8%	15.9%
30–34	11.6%	10.3%	9.8%	11.7%	11.1%	10.9%
35–39	6.4%	6.3%	5.1%	5.0%	6.4%	5.8%
40–44	3.0%	3.2%	2.8%	2.6%	2.9%	2.9%
45–49	1.4%	2.0%	2.9%	3.1%	3.6%	2.6%
50+	8.3%	11.1%	14.0%	15.1%	16.2%	13.1%
Age of HH head (average)	37.9	40.2	43.3	43.8	45.8	42.2
Age of other HH members (average)	16.2	18.2	19.5	20.3	21.1	19.2
Male head of household (% HH)	86.6%	87.9%	87.7%	85.6%	85.8%	86.7%
HH size:						
2	1.1%	0.0%	0.2%	0.0%	0.0%	0.3%
3	26.6%	22.7%	15.3%	14.1%	10.7%	17.9%
4	36.0%	31.8%	31.3%	32.1%	29.4%	32.1%
5	24.2%	28.1%	30.5%	30.4%	31.3%	28.9%
6	8.8%	12.9%	16.3%	15.7%	19.6%	14.7%
7	2.1%	2.6%	4.0%	5.8%	4.6%	3.8%
8	0.8%	1.3%	1.4%	1.1%	2.1%	1.3%
9	0.2%	0.5%	0.6%	0.8%	1.1%	0.6%
10	0.2%	0.2%	0.3%	0.2%	1.0%	0.4%
13	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
HH size (average)	4.2	4.5	4.7	4.7	4.9	4.6
Total Number of Children Under Five Years of Age:						
1	76.9%	83.1%	82.7%	83.4%	81.3%	81.5%
2	22.3%	16.6%	16.8%	16.1%	17.7%	17.9%
3	0.8%	0.3%	0.5%	0.5%	0.8%	0.6%
4	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
Number of children under five years of age (average)	1.24	1.17	1.18	1.17	1.20	1.19

TABLE 3: EDUCATIONAL ATTAINMENT OF HOUSEHOLD MEMBERS

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Number of HH heads completed primary school (% HH heads)	78.0%	82.6%	82.7%	87.2%	88.5%	83.8%
Educational Attainment of HH Head:						
No education	4.3%	1.8%	1.1%	1.5%	0.5%	1.8%
Incomplete primary	18.6%	16.2%	16.6%	11.6%	11.2%	14.8%
Complete primary	43.8%	42.6%	42.9%	42.6%	31.9%	40.7%
Incomplete secondary	24.7%	27.2%	24.3%	24.1%	23.0%	24.7%
Complete secondary	7.5%	10.7%	12.6%	13.9%	18.7%	12.7%
Higher	1.2%	1.5%	2.5%	6.2%	14.7%	5.2%
Female HH members (>5 years old) attended or currently attending school (% HH members)	95.8%	98.3%	98.4%	98.5%	99.4%	98.1%
Educational Attainment of Female HH Members:						
No education	2.7%	1.3%	1.3%	1.0%	0.5%	1.3%
Incomplete primary	23.9%	20.7%	18.1%	17.3%	15.0%	18.7%
Complete primary	39.7%	40.5%	36.4%	35.4%	28.5%	35.7%
Incomplete secondary	24.1%	25.8%	27.0%	24.8%	22.7%	24.9%
Complete secondary	9.0%	10.6%	13.8%	16.0%	17.7%	13.8%
Higher	0.5%	1.0%	3.4%	5.4%	15.7%	5.7%
Other HH members (>5 years old) attended or currently attending school (% HH members)	97.4%	98.7%	98.8%	99.1%	99.5%	98.8%
Educational Attainment of Other HH Members:						
No education	4.4%	1.8%	1.6%	1.6%	0.7%	1.9%
Incomplete primary	21.6%	21.2%	19.8%	18.0%	15.2%	19.0%
Complete primary	41.0%	40.6%	37.0%	36.4%	31.0%	37.0%
Incomplete secondary	24.7%	25.0%	26.5%	24.6%	22.1%	24.5%
Complete secondary	8.0%	10.4%	12.2%	14.1%	15.8%	12.3%
Higher	0.3%	1.0%	2.9%	5.3%	15.2%	5.3%

World Bank. Among household heads there is a reasonably small difference between primary school completion between the poorest and wealthiest households, however the disparity in post-secondary educational attainment between the poorest and wealthiest is more pronounced.

Female and other household member school attendance is high, at over 98% of household members, and female household members in particular, attending or having attended school.

Table 4 presents a complete summary of household assets by wealth quintile as well as non-labor income, such as government transfers and cash remittances. In the households sampled, televisions, bicycles, motorbikes, telephones (including mobile), and electric fans are common household assets, owned by over three-quarters of households. Since the household assets shown in Table 4 make up the wealth index, differences are expected in asset ownership by quintile. For instance, only 27% of the poorest households own a telephone, including a mobile phone, whereas 97% of the

TABLE 4: PERCENT DISTRIBUTION OF HOUSEHOLD ASSETS AND NON-LABOR INCOME

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Average HHs non-labor income in VND (millions)	0.96	1.39	1.93	2.26	8.98	3.05
HH Assets:						
Radio, CD, cassette	2.7%	5.9%	9.4%	9.3%	20.4%	9.5%
TV	65.4%	95.8%	99.2%	99.5%	100.0%	92.0%
VCR	13.9%	47.9%	69.8%	81.2%	91.7%	60.9%
Computer	1.1%	0.2%	1.1%	5.6%	23.3%	6.3%
Bicycle	69.2%	74.8%	75.7%	80.8%	77.0%	75.5%
Motorcycle	34.9%	77.5%	89.8%	93.0%	97.6%	78.5%
Automobile or truck	0.0%	0.2%	2.1%	2.7%	8.3%	2.7%
Refrigerator	0.0%	3.4%	6.5%	32.7%	86.4%	25.8%
Gas stove	3.5%	11.2%	39.0%	74.1%	94.1%	44.4%
Blender	2.7%	8.1%	16.8%	39.3%	80.0%	29.4%
Microwave	0.0%	0.0%	0.0%	0.5%	6.1%	1.3%
Washing machine	0.0%	0.2%	0.3%	2.9%	35.0%	7.7%
Water boiler	2.6%	3.7%	14.4%	28.3%	51.1%	20.0%
Machinery, equipment for household business	0.2%	1.1%	1.6%	3.8%	5.1%	2.4%
Boat	1.0%	1.8%	2.6%	3.0%	4.6%	2.6%
Telephone (including mobile)	27.1%	74.0%	88.8%	93.6%	97.1%	76.1%
Air conditioner	0.2%	0.0%	0.5%	0.5%	3.8%	1.0%
Electric fan	81.8%	97.3%	98.1%	99.8%	99.8%	95.4%
HH owns other piece of land	8.1%	11.8%	19.5%	24.9%	26.0%	18.1%
HH owns farm equipment	11.6%	13.6%	22.7%	28.3%	23.5%	19.9%
HH has animals	38.8%	39.1%	29.2%	34.7%	41.4%	36.6%
Number of livestock owned per HH (average)	1.11	1.07	1.23	1.16	0.94	1.10

richest households own a phone. Ownership of a motorbike is another asset owned largely by the wealthier households. Automobiles are still quite rare in rural Vietnam, with just 2.7% of households in this sample owning a car or truck. Computers are likewise absent in rural Vietnamese households. Around 45% of households own a gas stove, but just 3.5% of the poorest households have this type of cook stove. Ownership of animals is quite consistent across wealth quintiles, averaging 36.6% of households overall.

Overall, 75.6% of the households declared having income sources not classified as labor income, such as remittances, government transfers, household production of products, and agricultural activity income not mentioned as primary or secondary work earnings. The average household non-labor income, considering only positive values, is approximately 3.05 million VND per household. Non-labor income is highly positively associated with wealth quintile, with households in the top quintile reporting more than nine times the non-labor income of the poorest households.

Table 5 presents details on the principal economic activity for household respondents over 15 years of age. Overall, engagement in economic activity is high in the sample.

TABLE 5: EMPLOYMENT CHARACTERISTICS OF HOUSEHOLD MEMBERS

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
HH head is employed (% HH heads)	87.1%	88.2%	87.2%	84.6%	81.8%	85.8%
Other HH member is employed (% other HH members)	76.0%	74.1%	75.8%	76.1%	75.1%	75.4%
Last Week Activity—HH Head is Unemployed:						
Looking for work	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Studying	0.0%	1.4%	1.3%	1.0%	0.9%	0.9%
Looking after the home	43.8%	39.7%	42.5%	37.5%	30.7%	38.1%
Rent earner	2.5%	6.8%	3.8%	5.2%	1.8%	3.8%
Not working and not looking for job	53.8%	52.0%	52.6%	56.3%	66.7%	57.1%
Last Week Activity—Other HH Member is Unemployed:						
Looking for work	1.8%	0.7%	1.0%	1.0%	3.2%	1.6%
Studying	16.0%	16.0%	21.3%	13.4%	19.5%	17.4%
Looking after the home	64.8%	67.4%	61.8%	65.6%	51.5%	61.7%
Rent earner	1.4%	1.8%	1.0%	2.6%	2.0%	1.8%
Not working and not looking for job	16.0%	14.2%	15.0%	17.3%	23.8%	17.5%
Primary Employment Status (% All Employed):						
Self-employed	4.0%	6.3%	7.5%	7.1%	8.7%	6.9%
Employee	15.5%	19.7%	21.8%	27.0%	35.4%	24.4%
Employer or boss	0.0%	0.1%	0.1%	0.5%	1.3%	0.4%
Worker without remuneration	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Day laborer	9.8%	7.2%	3.7%	3.3%	2.3%	5.0%
Working in household production, trade or business	70.2%	65.9%	66.4%	61.5%	51.5%	62.7%
Other	0.4%	0.6%	0.5%	0.5%	0.8%	0.6%
Monthly Salary in VND (millions):						
Self-employed	1.31	1.39	1.51	1.94	2.53	1.85
Employee	1.52	1.77	2.21	2.23	2.79	2.26
Employer or boss[14]	—	18.00	2.00	4.50	4.61	5.26
Day laborer	1.14	1.34	1.33	1.35	3.01	1.44
Working in household production, trade or business[15]	—	—	—	—	—	—
Other	0.21	0.73	0.92	2.56	2.30	1.58
Total	1.36	1.65	1.95	2.11	2.77	2.09
Hours Worked per Day:						
Self-employed	7.4	7.4	7.3	7.9	7.8	7.6
Employee	8.3	8.4	8.4	8.3	8.3	8.3

(*Continued*)

[14] There were no employers/bosses in 1st wealth quintile. The 18 million VND figure is the result of just one individual reporting income of 900,000 VND (approx. US$50) per day, which on a monthly basis is equivalent to 18 million VND.

[15] Labor income from household production, trade, or business is reported under "Module 4: Household Income" in the household survey.

TABLE 5: (Continued)

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Employer or boss	—	9.0	9.0	8.6	8.7	8.7
Worker without remuneration	17.0	—	—	—	—	17.0
Day laborer	7.9	8.0	7.8	8.1	7.5	7.9
Working in household production, trade or business	7.3	7.0	7.0	7.3	7.4	7.2
Other	8.0	6.3	10.5	6.9	7.2	7.4
Total	7.5	7.4	7.4	7.6	7.7	7.5
Days Worked per Month:						
Self-employed	20.2	22.1	20.7	23.2	23.2	22.1
Employee	21.8	23.6	23.9	24.4	23.9	23.7
Employer or boss	—	27.0	19.5	22.3	26.5	25.2
Worker without remuneration	28.0	—	—	—	—	28.0
Day laborer	18.5	19.7	20.3	19.1	21.1	19.4
Working in household production, trade or business	19.3	17.8	18.0	19.0	20.5	18.9
Other	24.0	22.5	19.3	18.8	21.8	21.3
Total	19.7	19.5	19.6	20.8	22.0	20.3
Months Worked in Last 12 Months:						
Self-employed	10.2	12.0	12.0	10.1	12.0	11.4
Employee	9.6	10.6	10.9	11.3	11.4	11.0
Employer or boss	—	12.0	11.0	10.9	11.6	11.4
Worker without remuneration	2.0	—	—	—	—	2.0
Day laborer	9.6	10.6	10.4	10.2	10.3	10.2
Working in household production, trade or business	8.1	8.1	8.0	8.2	8.6	8.2
Other	10.2	12.0	12.0	10.1	12.0	11.4
Total	8.6	9.0	9.0	9.3	10.0	9.2

Just under 86% of household heads were employed in the week prior to the interview, and 75% of other household members older than 15 years were employed. Interestingly, the figures are higher for the poorest households (87.1% and 76.0% for HH heads and other HH members, respectively). The week before the interview, unemployed HH heads were either both not working and not looking for a job (57.1%), or were looking after their homes (38.1%). The majority of other HH members who were unemployed the previous week were looking after the home (61.7%).

For household members, including household heads, who were employed the week prior to the survey, 62.7% classified their primary work over the past 12 months as work in household production or services in planting, breeding, forestry or aquaculture, or work in trade or business for the household. Another quarter of the employed household members classified themselves as employees. This figure is highest for the wealthiest households, while the poorest households are more likely to work in household production or trade. Very few households classified their primary work as self-employment, because of the fact that although they work

for themselves in household production, services, or trade, they do not earn wages or salary in return for this work.

The average monthly salary for primary work is 2.09 million VND (US$113), but this varies from 1.07 million VND for household production or services to 5.26 million VND for employers. As expected, there are large differences between the poorest and wealthiest quintiles in average monthly salaries, with self-employed and employees in the wealthiest quintile earning on average twice the monthly salary of those in the poorest. Working hours and days are roughly consistent across job type and wealth quintile, with an overall average working day of 7.5 hours and working days per month of 20.3. Those working in household production or services worked the fewest number of months in the previous year, an average of 8.2 months.

3.2 Handwashing Behavior

The Scaling up Handwashing project seeks to achieve health and non-health impacts by promoting handwashing with soap at critical times. Objectively measuring handwashing behavior is therefore critical to the assessment of impacts of the intervention. Handwashing behavior is measured at baseline in two ways: self-reported handwashing at critical times, that is after defecation or contact with a child's feces, and before cooking or preparing food and feeding a child, and through spot-check observations of whether the household has a designated place for handwashing with both soap and water available. An additional measure assesses the cleanliness of the caretaker's hands through direct observation. These measures serve as proxy indicators of handwashing with soap behavior in this study, since the actual behavior and when it takes place is not observed in the context of the household survey.

The Vietnam Women's Union demonstrates proper handwashing technique

As shown in Tables 6A and 6B, nearly all caregivers, despite their socioeconomic status, reported washing their hands with soap at least once during the past 24 hours when prompted. However, self-reported frequency of handwashing at particular critical times is lower. When prompted for the occasions over the past 24 hours during which they washed their hands with soap, an average of 47.1% reported to have washed hands with soap after using the toilet. This was followed by those who reported washing hands with soap before feeding a child (33.2%) and after cleaning a child's bottom (32.1%). Of the four critical times, washing hands with soap before cooking or preparing food was the least frequently mentioned (31.0%). Self-reported handwashing after using the toilet was lower on average in the lowest three wealth quintiles than in the wealthier quintiles. However, those in the bottom two quintiles were more likely to report washing hands with soap after cleaning a child's bottom. On average 78.4% of caretakers mentioned at least one of the four critical times, but the wealthiest were much more likely (86.4%) than the poorest (73.3%) to mention a critical time.

There are some large differences evident between the three provinces as shown in Table 6B. Self-reported handwashing is lowest in Tien Giang province (90.3%), as is the percentage who reported washing hands with soap on at least one critical time (68.0%). While self-reported handwashing is highest in Hung Yen province (98.9%), only 81.0% of caretakers in Hung Yen mention a critical time. Other occasions for handwashing that were commonly mentioned were doing laundry (45.6% of caretakers) and because they look or feel dirty (47.7% of caretakers). The findings show that some critical times are not at the top of the mind for caretakers of young children, as less than one-third reported

TABLE 6A: SELF-REPORTED HANDWASHING WITH SOAP BEHAVIOR BY WEALTH QUINTILE (PREVIOUS 24 HOURS)

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Washed hands with soap at least once in previous 24 hours (% caregivers)	93.3%	90.4%	93.6%	96.7%	96.7%	94.1%
Washed Hands with Soap At Least Once in Previous 24 Hours During the Following Events (% Caregivers):						
Using the toilet (% caregivers)	42.0%	40.9%	44.1%	52.1%	56.6%	47.1%
Cleaning child's bottom (% caregivers)	37.7%	33.9%	31.9%	28.2%	28.7%	32.1%
Cooking or preparing food (% caregivers)	34.3%	26.5%	30.5%	30.3%	33.1%	31.0%
Feeding children (% caregivers)	33.5%	29.7%	33.5%	32.6%	36.6%	33.2%
Washed hands with soap during at least one critical time (% caregivers)	73.3%	73.6%	77.0%	81.7%	86.4%	78.4%

TABLE 6B: SELF-REPORTED HANDWASHING WITH SOAP BEHAVIOR BY PROVINCE (PREVIOUS 24 HOURS)

	Province			
	Hung Yen	Thanh Hoa	Tien Giang	Total
Washed hands with soap at least once in previous 24 hours (% caregivers)	98.9%	93.5%	90.3%	94.2%
Washed Hands with Soap at Least Once in Previous 24 Hours During the Following Events (% Caregivers):				
Using the toilet (% caregivers)	50.2%	57.5%	36.3%	47.1%
Cleaning child's bottom (% caregivers)	37.2%	54.7%	9.7%	31.9%
Cooking or preparing food (% caregivers)	24.1%	47.3%	25.0%	31.1%
Feeding children (% caregivers)	22.5%	47.6%	32.3%	33.3%
Washed hands with soap during at least one critical time (% caregivers)	81.0%	89.2%	68.0%	78.5%

handwashing with soap after cleaning a child's bottom and before cooking or preparing food, and just around one-third before feeding children.

It is worth noting the limitations of this proxy measure for handwashing behavior, since not all critical times can be expected to take place during the period 24 hours prior to the survey. However, the differences noted by province and by wealth quintile are instructive since particular critical times would not be expected to be systematically associated with either geographical location or household wealth status.

Table 7 presents findings with regards to access to a place for washing hands with water and soap present anywhere in the home or yard. On average a place for washing hands with both soap and water present was observed in 80.8% of households. Less common, however, was access to a place for washing hands with soap and water in the poorest households (70.2%). This finding points to a clear positive association between wealth and presence of a place for washing hands, with the proportion of households with a place to wash hands steadily increasing as households move up the wealth index. Furthermore, it underscores the

TABLE 7: OBSERVATION OF PLACE FOR WASHING HANDS BY WEALTH QUINTILE AND PROVINCE

	Observed Place for Washing Hands with Soap and Water (% HHs)					
	Anywhere in the Home	Inside Toilet or Food Preparation Facility	Within 1 Meter of Toilet Facility	Between 1 and 3 Meters of Toilet Facility	More than 3 Meters from Toilet Facility	Pond or Stream Located Elsewhere in the Yard
Wealth Quintile						
1st	70.2%	10.0%	9.3%	11.3%	31.6%	10.2%
2nd	74.4%	13.8%	13.5%	8.9%	28.1%	10.4%
3rd	80.8%	19.2%	15.6%	11.3%	26.3%	7.3%
4th	87.1%	32.1%	17.2%	10.1%	22.0%	3.7%
5th	91.4%	55.1%	11.9%	6.8%	15.6%	1.8%
Province						
Hung Yen	83.2%	26.5%	14.4%	16.7%	23.7%	1.3%
Thanh Hoa	87.2%	12.2%	13.8%	7.1%	43.8%	13.4%
Tien Giang	73.5%	36.8%	12.8%	4.9%	11.0%	6.4%
Total	80.8%	26.3%	13.6%	9.6%	24.6%	6.6%

A typical place for washing hands with soap in rural Vietnam

importance of targeting the handwashing project to the poor in order to achieve the greatest impacts. The findings by province are likewise instructive, where access to a place for handwashing is lowest in Tien Giang province (73.5%), and highest in Thanh Hoa (87.2%).

The proximity of a place for washing hands to the latrine or place of food preparation is hypothesized to be a key determinant of handwashing behavior, since the farther an individual must walk to wash her hands after defecation or before preparing food, the more likely she is to be distracted by another activity. In the households sampled, a place for handwashing that has both soap and water present was most commonly found either inside the toilet or food preparation facility (26.3%), or in the yard more than three meters from the toilet facility (24.6%). However, there are large differences observed by socioeconomic status. The wealthiest households are most likely to have a place for washing hands in the toilet or food preparation facility (55.1%), while this is much less common for the poorest households (10.0%). Conversely, the poorest households are most likely to have the a place for washing hands located in the yard more than three meters from the toilet facility (31.6%), which is much less common in the wealthiest households (15.6%). In a little over 10% of households in the 1st and 2nd wealth quintile, the place for washing hands is observed to be a pond or stream located somewhere in the

At a community meeting members discuss the critical times for handwashing

yard. What is evident from these findings is that the poorer the household, the farther they must travel to wash their hands with soap and water after using the toilet and before preparing food and/or eating. If the location of the place for handwashing is indeed a determinant of handwashing behavior, and the presence of soap and water at this place serves as an environmental cue to wash the hands, the poorer households in this sample population may be less likely to wash their hands with soap and water at the critical times.

Location of the place for washing hands by province helps to elucidate some of the findings by wealth quintile above. In Thanh Hoa we find a much higher than average proportion of households has a place for washing hands that is located farther than three meters from the toilet facility (43.8%), but this is much less common in Tien Giang (11.0%), where the majority of households have a place for washing hands inside the toilet or food preparation facility (36.8%). It appears from the cross tabulation that households in Thanh Hoa province account for the sizeable percentage of households where the place for washing hands is located in a pond or stream.

Further information was collected from all households on the place for washing hands about the location of the handwashing device, the type of handwashing device, whether water was available at the time of observation, the type of soap present, and whether ash or mud was observed at the place for washing hands. These observations were made separately for places used to wash hands after going to the toilet, and those used before preparing food, eating, or feeding a child.

Table 8A summarizes findings for the principal place used by the household members to wash hands after going to the toilet. A simple homemade water tap or dispenser (sometimes called a "tippy tap") that tips over to release a small amount of water, is the most common type of handwashing device with 43.5% of households having this type. Another 27.4% of households have a water tap or faucet for handwashing. This device is most common in the wealthiest households (45%) as opposed to the poorest (14.3%). The basin or bucket is more common in poorer households (30.7%) than in wealthier households (8.1%). In 98.0% of households, water was observed at the place used for washing hands after going to the toilet. The presence of soap was also common; at least one type of soap was present at the place for washing hands in close to 94% of households. Liquid soap was the least common type of soap observed (17.6%), and bar soap was much more common in the wealthier households (71.1%) than in the poorest (28.8%). Interestingly, powdered soap, such as laundry soap or detergent, was the most common type of soap regardless of household wealth. On average, 61.9% of households had this type of soap present at the place used to wash hands. Ash and mud, which are substances often used for handwashing in poor communities of South Asia, do not appear to be commonly used cleansing agents in Vietnam. On average, just 3.6% of households were observed to have mud for handwashing at or near the handwashing device, 1.0% had ash, and 2.6% had both ash and mud. These cleansing agents are slightly more common among the 1st, 2nd, and 3rd wealth quintiles. On average, the complete absence of a cleansing agent was observed in just 6.0% of households, confirming formative research findings that availability of soap is generally not a constraint to handwashing.[16]

[16] Curtis 2009.

TABLE 8A: OBSERVATION OF A PLACE FOR WASHING HANDS AFTER GOING TO TOILET

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Location of Handwashing Device (% HHs):						
Inside toilet facility	9.3%	11.8%	16.8%	27.8%	49.8%	23.3%
Inside food preparation facility	2.0%	3.3%	3.9%	6.3%	6.4%	4.4%
Less than 1 meter from toilet facility	11.3%	20.7%	19.2%	18.2%	12.1%	16.3%
Between 1 and 3 meters from toilet facility	12.7%	10.0%	12.3%	10.5%	7.4%	10.5%
More than 3 meters from toilet facility	37.9%	32.1%	29.0%	24.1%	17.7%	28.0%
No specific place	14.2%	10.0%	9.8%	9.2%	4.3%	9.5%
Type of Handwashing Device (% HHs):						
Tap, faucet	14.3%	20.9%	23.4%	30.3%	45.0%	27.4%
Homemade water tap	38.2%	40.9%	48.3%	48.2%	41.5%	43.5%
Basin, bucket	30.7%	28.0%	18.7%	12.9%	8.1%	19.2%
Other	16.8%	10.1%	9.5%	8.5%	5.4%	9.8%
Water is available at place for washing hands (% HHs)	96.1%	97.6%	97.3%	99.3%	99.3%	98.0%
Soaps Available at Place for Washing Hands (% HHs):						
Bar soap	28.8%	34.4%	42.4%	51.3%	71.1%	45.8%
Liquid/dishwashing soap	10.3%	16.1%	18.4%	17.4%	25.4%	17.6%
Powder/laundry soap/detergent	61.3%	61.0%	62.9%	61.1%	63.0%	61.9%
No soap observed	7.6%	11.7%	6.3%	4.2%	2.4%	6.4%
Ash, Mud at Place for Washing Hands (% HHs):						
Ash	1.4%	0.9%	1.3%	0.9%	0.5%	1.0%
Mud	4.8%	6.0%	4.0%	1.9%	1.6%	3.6%
Ash and Mud	4.4%	3.2%	3.2%	1.7%	0.9%	2.6%
Neither ash nor mud	89.4%	89.9%	91.5%	95.5%	96.9%	92.7%
No cleansing agents at place for HW (no soap, nor ash, nor mud observed) (% HHs)	6.8%	10.9%	5.3%	4.3%	3.1%	6.0%

Table 8B presents the findings for the same set of variables in regards to the place used for handwashing before preparing food, eating, or feeding children. A total of 37.1% of households reported that family members usually use a different place for washing hands at these times than that used after going to the toilet. If the respondent indicated the same place for washing hands at all critical times, the results from Table 8A are reported. The findings show that 15.6% of the devices used for handwashing when preparing food or feeding a child are located inside the food preparation facility. In 44.3% of households the handwashing device is a homemade water tap, and in 27.1% it is a tap or faucet. However, in the wealthiest households a tap or faucet is the most common device (44.8%). Again, in nearly all households water was observed at the place reported to be used for washing hands before preparing food or feeding a child (98.0%), and in 98.2% soap was observed. Powder soap or detergent was again the most commonly observed handwashing agent (67.8%), but bar soap was likewise

TABLE 8B: OBSERVATION OF A PLACE FOR WASHING HANDS WHEN PREPARING FOOD OR FEEDING A CHILD

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Location of Handwashing Device (% HHs):						
Inside food preparation facility	6.5%	9.9%	9.8%	18.2%	33.0%	15.6%
No specific place	15.4%	10.1%	10.3%	9.5%	4.4%	9.9%
Type of Handwashing Device (% HHs):						
Tap, faucet	15.5%	20.5%	22.1%	29.0%	44.8%	27.1%
Homemade water tap	39.2%	41.7%	49.2%	49.1%	41.9%	44.3%
Basin, bucket	31.1%	28.9%	20.0%	13.8%	8.2%	19.8%
Other	14.2%	8.9%	8.7%	8.1%	5.1%	8.8%
Water is available at place for washing hands (% HHs)	97.2%	98.3%	98.1%	99.4%	98.8%	98.4%
Soaps Available at Place for Washing Hands (% HHs):						
Bar soap	30.1%	34.6%	42.9%	50.8%	64.9%	45.3%
Liquid/dishwashing soap	11.8%	16.5%	19.9%	20.0%	21.1%	18.0%
Powder/ laundry soap/detergent	69.1%	67.5%	71.6%	67.3%	64.2%	67.8%
No soap observed	7.7%	12.9%	6.9%	4.4%	4.6%	7.2%
Ash, Mud at Place for Washing Hands (% HHs):						
Ash	0.9%	0.8%	0.6%	0.0%	0.7%	0.6%
Mud	4.3%	4.9%	3.4%	2.1%	1.6%	3.2%
Ash and mud	3.5%	2.0%	1.2%	1.4%	1.1%	1.8%
Neither ash nor mud	91.3%	92.4%	94.9%	96.5%	96.5%	94.4%
No cleansing agents at place for HW (no soap, nor ash, nor mud observed) (% HHs)	6.5%	12.7%	7.4%	5.1%	6.1%	7.6%

common and observed in 45.3% of households, followed by liquid soap in 18.0% of households. Finally, in 94.4% of the households the interviewer observed neither ash nor mud at the place for washing hands, in 3.2% of the households only mud was observed, and in 1.8% of the households both ash and mud was observed. Again, the proportion of households with no cleansing agent available at the observed place for handwashing is very low (7.6%).

An additional objective indicator of caretaker hygiene was the observation of the caretaker's hands. During this portion of the survey the interviewer asked to look at the fingernails, palms, and fingerpads of the caretaker and recorded their appearance on a scale of visibly dirty, unclean appearance, and clean appearance. Both palms and fingerpads were observed to be clean for 78.7% and 78.2% of caretakers respectively, and fingernails were less clean looking (63.4%). Around 20% of palms and fingerpads appeared unclean, as did nearly one-third of caretaker's fingernails. The observed cleanliness of hands does appear to be associated with socioeconomic status, most notably the appearance of fingernails, which were observed to have an unclean appearance in 37.0% of caretakers in the lowest wealth quintile, compared with 23.6% of those in the highest quintile. The results are shown in Table 9.

TABLE 9: OBSERVATION OF CAREGIVER'S HANDS BY WEALTH QUINTILE

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Caregiver's Fingernails Appear to Have:						
Visible dirt	7.8%	5.9%	6.3%	4.5%	1.9%	5.3%
Unclean appearance	37.0%	34.3%	32.8%	27.9%	23.6%	31.1%
Clean appearance	54.7%	59.6%	60.8%	67.5%	74.5%	63.4%
Caregiver's Palms Appear to Have:						
Visible dirt	3.5%	1.9%	1.9%	1.3%	1.0%	1.9%
Unclean appearance	20.5%	20.7%	21.5%	18.0%	15.4%	19.2%
Clean appearance	75.5%	77.2%	76.4%	80.6%	83.6%	78.7%
Caregiver's Fingerpads Appear to Have:						
Visible dirt	2.9%	2.1%	1.6%	1.0%	1.0%	1.7%
Unclean appearance	22.2%	21.0%	22.5%	17.5%	16.1%	19.9%
Clean appearance	74.4%	76.7%	75.7%	81.4%	83.0%	78.2%

3.3 Diarrhea, Acute Lower Respiratory Infection, and Anemia Prevalence

Recent health histories were obtained from caretakers for all children younger than five in the household. Symptoms that were prompted included fever, cough, congestion, diarrhea related symptoms, nausea, vomiting, stomach pain or cramps, and refusal to eat. The findings presented below focus on the prevalence of diarrhea and acute lower respiratory infection in the under five population of the sample.

Diarrhea was defined as the reported presence of three or more loose or watery stools over a 24-hour period, or one or more stools with blood and/or mucus present in the stool (Baqui et al. 1991) using the symptom data obtained from the child health histories. Acute lower respiratory infection (ALRI) was defined using the clinical case definition of the World Health Organization (WHO 2005), which diagnoses a child as having an ALRI when he/she presents the following symptoms: constant cough or difficulty breathing, and raised respiratory rate (>60 breaths per minute in children less than 60 days of age, >50 breaths per minute for children between 60 – 364 days of age, >40 per minute for children between 1–5 years of age).

A summary of diarrhea, ALRI, and anemia prevalence in the sampled population of children under five is shown

A child is tested for anemia

TABLE 10: DIARRHEA, ALRI, AND ANEMIA PREVALENCE BY POVERTY STATUS AND ACCESS TO PLACE FOR WASHING HANDS (CHILDREN <5)

	Poor		Access to Place for Washing Hands with Soap and Water (% HHs)		Total
	Yes	No	Yes	No	
Child had diarrhea symptoms in previous 48 hours (% children)	0.6%	0.8%	0.7%	0.7%	0.7%
Child had diarrhea symptoms in previous week (% children)	1.2%	1.1%	1.2%	1.1%	1.2%
Child had diarrhea symptoms in past 14 days (% children)	1.2%	1.3%	1.2%	1.3%	1.3%
Child had ALRI symptoms in previous 48 hours (% children)	0.6%	0.4%	0.5%	0.3%	0.5%
Child had ALRI symptoms in previous three days (% children)	0.9%	0.6%	0.8%	0.3%	0.7%
Anemia (Hb <110 g/L)	34.6%	28.7%	31.8%	31.1%	31.6%

in Table 10. Caregiver reported intestinal symptoms for 6.0% of children; however, diarrhea prevalence as defined is less than 1% among children under five during the 48 hours prior to the survey, and just over 1% for both seven and 14 days prior to the survey. Similarly low prevalence rates of ALRI were found. Although 21.6% of children in the sample had caregiver reported respiratory symptoms in the two weeks prior to the survey, the prevalence of clinically defined ALRI in the sample is low: just 0.5% of children had symptoms consistent with ALRI in the previous 48 hours and a three-day prevalence of 0.7%. Contrary to estimates based on the VNDHS 2002 and MICS3 2006 data,[17] the findings in relation to caregiver reported diarrhea and ALRI prevalence for this sample of children under five is low. It is important to note, however, that relative to more objective health measures collected as part of the survey, such as child anthropometrics and anemia, the findings are internally consistent. Moreover, they are consistent across the Scaling Up countries, where the correlation between caregiver reported diarrhea and ALRI and the objective health measures is high.

These findings are cross tabulated by both poverty status and access to an observed place for handwashing with soap and water. While some of the findings may appear counter-intuitive, such as the slightly higher two-day and 14-day prevalence of diarrhea in the non-poor households, scientifically these findings are no different. Access to a place for washing hands likewise does not appear associated with prevalence of diarrhea or ALRI symptoms. However, we do find the anemia prevalence of 34.6% among children from poor households is significantly higher (t=3.46) than those from non-poor households (28.7%).

Diarrhea and ALRI prevalence by province are shown in Table 11. We find that reported diarrhea prevalence is below average in Tien Giang (two-day 0.4%, seven-day 0.7%, and 14-day 0.8%), whereas children in Hung Yen have the highest reported seven-day (1.7%) and 14-day (1.8%) diarrhea prevalence. In Thanh Hoa children have higher than average ALRI prevalence for both 48 hour (1.0%) and three-day (1.1%) caregiver reported prevalence.

[17] The nationally representative VNDHS 2002 survey reported two-week diarrhea prevalence of 11%, whereas the nationally representative MICS 2006 (third round) survey reported two-week diarrhea prevalence of 6.8%.

Diarrhea prevalence and treatment by wealth quintile is shown in Table 12. On average, 54.1% of caregivers with children presenting intestinal symptoms[18] in the two weeks prior to the survey treated the child with a pill or syrup and 8.2% used an oral rehydration solution (ORS). Another 6.9% used another treatment such as an intravenous fluid injection (IV), traditional remedies, or a homemade sugar or salt water solution, and 16.5% did not seek treatment for the symptoms. These figures varied only slightly by wealth quintile, with those households in the 2nd and 3rd quintiles most likely to report treating intestinal symptoms with a pill or syrup. ORS was more commonly given as a treatment in the higher wealth quintiles, while treatment with another method was higher than average (11.8%) in the lowest quintile.

Table 13 shows ALRI prevalence and treatment by wealth quintile. Children from households classified as poorest in the study sample show higher than average reported prevalence of ALRI (1.1% and 1.2% respectively for two-day and seven-day prevalence). However, there is higher than average reported prevalence in the 4th wealth quintile. Treatment with a pill or syrup for respiratory symptoms[19] was very common, with 90.2% of caretakers using this method of treatment. Just 3.4% opted not to treat, and another 11.1% used another type of treatment such as an IV or traditional remedy. The findings are consistent across wealth quintiles.

As part of the child health history, caregivers were asked whether they sought medical advice for their child during the past two weeks for diarrhea or respiratory symptoms. The findings are shown in Table 14. Although reported prevalence of diarrhea and ALRI is very low in the sample, a high percentage of caregivers sought medical advice (46.7%), with the majority of treatment sought from private providers (50.4%). This is followed by 26.1% of households who sought treatment from a pharmacist, and 10.0% who took the child for an overnight stay at a hospital or clinic. Caregivers from the poorest households reported taking their child for an overnight stay at a hospital or clinic (16.0%) due to illness more than the average for the entire sample, while they took their child for a day visit to the doctor less than average (38.2%). For all wealth quintiles medical advice was more often sought from private

TABLE 11: DIARRHEA AND ALRI PREVALENCE BY PROVINCE (CHILDREN <5)

	Province			
	Hung Yen	Thanh Hoa	Tien Giang	Total
Child had diarrhea symptoms in previous 48 hours (% children)	0.80%	0.90%	0.40%	0.70%
Child had diarrhea symptoms in previous week (% children)	1.70%	1.20%	0.70%	1.20%
Child had diarrhea symptoms in past 14 days (% children)	1.80%	1.30%	0.80%	1.30%
Child had ALRI symptoms in previous 48 hours (% children)	0.40%	1.00%	0.30%	0.50%
Child had ALRI symptoms in previous 72 hours (% children)	0.70%	1.10%	0.40%	0.70%

[18] Intestinal symptoms include: stomach pain or cramps, nausea, vomiting, three or more bowel movements in one day and one night, water or soft stool, mucus or blood in stool, or refusal to eat.

[19] Respiratory symptoms include: cough, congestion, panting/wheezing, or difficulty breathing.

TABLE 12: DIARRHEA PREVALENCE AND TREATMENT BY WEALTH QUINTILE (CHILDREN <5)

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Child had diarrhea symptoms in previous 48 hours (% children)	0.8%	0.3%	0.6%	0.9%	0.8%	0.7%
Child had diarrhea symptoms in previous week (% children)	1.2%	0.8%	1.3%	1.4%	1.1%	1.2%
Child had diarrhea symptoms in previous 14 days (% children)	1.2%	0.8%	1.3%	1.7%	1.3%	1.3%
Treatment Sought for Intestinal Symptoms:						
No treatment	17.6%	8.2%	15.9%	20.8%	19.6%	16.5%
Pill or syrup	50.0%	63.3%	56.8%	50.0%	50.0%	54.1%
Oral rehydration solution	5.9%	8.2%	9.1%	8.3%	8.9%	8.2%
Other	11.8%	6.1%	4.5%	8.3%	5.4%	6.9%

TABLE 13: ALRI PREVALENCE AND TREATMENT BY WEALTH QUINTILE (CHILDREN <5)

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Child had acute lower respiratory infection symptoms in previous 48 hours (% children)	1.1%	0.2%	0.3%	0.8%	0.2%	0.5%
Child had acute lower respiratory infection symptoms in previous 72 hours (% children)	1.2%	0.8%	0.5%	0.9%	0.2%	0.7%
Treatment Sought for Respiratory Symptoms:						
No treatment	2.3%	4.5%	2.5%	4.9%	2.6%	3.4%
Pill or syrup	88.6%	90.9%	95.1%	90.3%	86.3%	90.2%
Other	12.6%	11.7%	8.0%	8.1%	15.7%	11.1%

TABLE 14: CARE-SEEKING BEHAVIOR FOR CHILD ILLNESS BY WEALTH QUINTILE

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Caregiver Sought Medical Advice of (% Caregivers):						
Did not seek	5.3%	4.2%	6.3%	6.7%	5.4%	5.6%
Day visit to doctor	38.2%	47.9%	46.8%	46.4%	54.0%	46.7%
Overnight stay at hospital or clinic	16.0%	10.7%	6.3%	10.9%	6.3%	10.0%
Pharmacist	26.2%	27.0%	28.3%	24.7%	24.1%	26.1%
Herbalist	0.0%	1.4%	0.4%	0.0%	0.0%	0.4%
Care sought from public provider (% caregivers)	37.6%	38.3%	35.6%	38.1%	35.2%	37.0%
Care sought from private provider (% caregivers)	46.9%	51.5%	50.9%	49.3%	53.5%	50.4%

TABLE 15: HOUSEHOLDS WITH LOST HOURS DUE TO CHILD ILLNESS BY WEALTH QUINTILE AND PROVINCE

	HH Lost Hours Due to Child Illness (% HHs)	Number of Hours Lost Due to Child Illness (average)
Wealth Quintile		
1st	15.9%	4.6
2nd	15.2%	4.7
3rd	17.3%	5.0
4th	18.1%	5.0
5th	19.0%	5.2
Province		
Hung Yen	26.6%	4.9
Thanh Hoa	3.7%	4.3
Tien Giang	18.5%	5.0
Total	17.0%	4.9

providers than public providers. Overall in the sample, care seeking behavior is quite high: only 5.6% of caregivers chose not to seek medical advice when their child was ill during the two weeks prior to the survey.

Finally, caregivers were asked whether they had lost working hours in the previous 14 days due to their child's reported symptoms. The findings, reported in Table 15, reveal that in an average of 17.1% of households, one or more primary caretakers lost time due to the illness of a child over the past 14 days. This is a strikingly high percentage given that the prevalence of diarrhea and ALRI in the population is low. The figure is higher than average at the higher wealth quintiles, which may be due to the perception that time off from unpaid or informal work (more typical of poorer households) to care for a sick child is not lost time. On average, primary caretakers reported 4.9 hours of lost time. There is little variation in the number of hours lost by wealth quintile. However, we find large differences between provinces in time lost to care for a sick child. Just 3.7% of households in Thanh Hoa reported lost time, while 26.6% of households in Hung Yen reported lost time. Little variation is found, however, in the number of lost hours across provinces.

Hemoglobin concentrations were obtained from children between six months and two years of age in order to estimate the percentage suffering from anemia. These results are reported in Table 16. Samples taken from children in households in the lowest wealth quintile had higher than average presence of anemia (35.5%), measured by hemoglobin concentration, suggesting that anemia is inversely associated with household wealth. The findings by province indicate a higher than average prevalence of anemia in Thanh Hoa. While around one-third of samples taken from children in the sample indicate presence of anemia, in Thanh Hoa province this figure is 47.9%. On average anemia was present in 31.7% of the samples taken.

3.4 Child Growth Measures

The survey included baseline child growth measures of children under the age of two, including head and arm circumference, length, and weight. To analyze the child growth findings, anthropometric Z-scores were assigned by comparing children in the sample to the WHO reference population median and standard deviation for each of the aforementioned variables (WHO 2006, 2007). The reference population is designed to be internationally applicable regardless of ethnicity, socioeconomic status, or feeding practices.

The Z-score for each measure indicates the number of standard deviation units from the median of the reference population. The WHO guidelines for child growth and malnutrition use a Z-score cutoff of less than –2 standard deviations (SD) below the median of the reference population for low weight-for-age, a measure of malnutrition, and less than –3 SDs from the median indicating that a child is severely malnourished. Low height-for-age, a measure of linear growth, of –2 SDs below the median indicates that a

TABLE 16: ANEMIA PREVALENCE BY WEALTH QUINTILE AND PROVINCE (CHILDREN <2)

	% Children with Anemia (Hb <110 g/L)
Wealth Quintile	
1st	35.5%
2nd	34.8%
3rd	31.3%
4th	31.0%
5th	25.9%
Province	
Hung Yen	23.8%
Thanh Hoa	47.9%
Tien Giang	26.2%
Overall	31.7%

An anthropometrician prepares to measure a child's arm circumference during a household interview

child is short for his or her age and is moderately or severely stunted. Stunting is an indication of chronic malnutrition. Finally, a low weight-for-height of –2 SDs below the reference median indicates wasting, which indicates a recent nutritional deficiency rather than chronic malnutrition.

As shown in Table 17 there is a sizeable proportion of children under two in the sample that are stunted, malnourished, and/or wasted. This is particularly notable when the findings are disaggregated by wealth and province. Nearly one-fifth of the children under two in the sample are stunted in the poorest households, and over 10% are malnourished in the two lowest wealth quintiles. Stunting of children appears to be highest in both Thanh Hoa and Hung Yen provinces, while Tien Giang fares better on all three indicators.

The histograms of the Z-scores for each child growth measure displayed in Figure 2 provide an additional illustration of the prevalence of inadequate child growth. Children outside of the normal range of healthy growth are plotted below the –2 SD and above the +2 SD cutoff points on the graph. Children who are malnourished are represented between the –5 and –2 SD cutoff point on the weight-for-age Z-score histogram, while those who are stunted, and those who are wasted are represented between the –6 and –2 SD cutoff points in the length/height-for-age Z-score and weight-for-length/height histograms respectively.[20] All measures besides arm circumference were found to be lower on average than the WHO reference population median, as indicated by a red vertical line on the graph.

Table 18A presents average Z-scores for the six child-growth measures disaggregated by wealth quintile. All average Z-scores are within 1 SD of the reference population median, indicating that on average the children in the sample exhibit healthy growth, although average Z-scores for all measures except arm-circumference for age are below the reference

[20] Calculated Z-scores below –5 and above 5 for weight-for-age and Z-scores below –6 and above 6 for height-for-age and weight-for-height are considered to be implausible and therefore are not included in the prevalence statistics presented in Table 18.

TABLE 17: PREVALENCE OF MALNUTRITION, STUNTING, AND WASTING BY WEALTH QUINTILE AND PROVINCE (CHILDREN <2)

	Malnourished (% Children –2 SDs Weight-for-Age Z-Score)	Stunted (% Children –2 SDs Height-for-Age Z-Score)	Wasted (% Children –2 SDs Weight-for-Height Z-Score)
Wealth Quintile			
1st	11.4%	19.4%	7.3%
2nd	11.5%	15.9%	5.6%
3rd	7.1%	13.2%	5.6%
4th	7.4%	11.0%	6.5%
5th	5.2%	10.7%	3.5%
Province			
Hung Yen	10.3%	15.6%	6.5%
Thanh Hoa	8.2%	16.3%	5.7%
Tien Giang	7.1%	11.0%	4.9%
Total	8.5%	14.0%	5.7%

FIGURE 2: HISTOGRAM OF CHILD GROWTH MEASURES (Z-SCORES) FOR CHILDREN <2

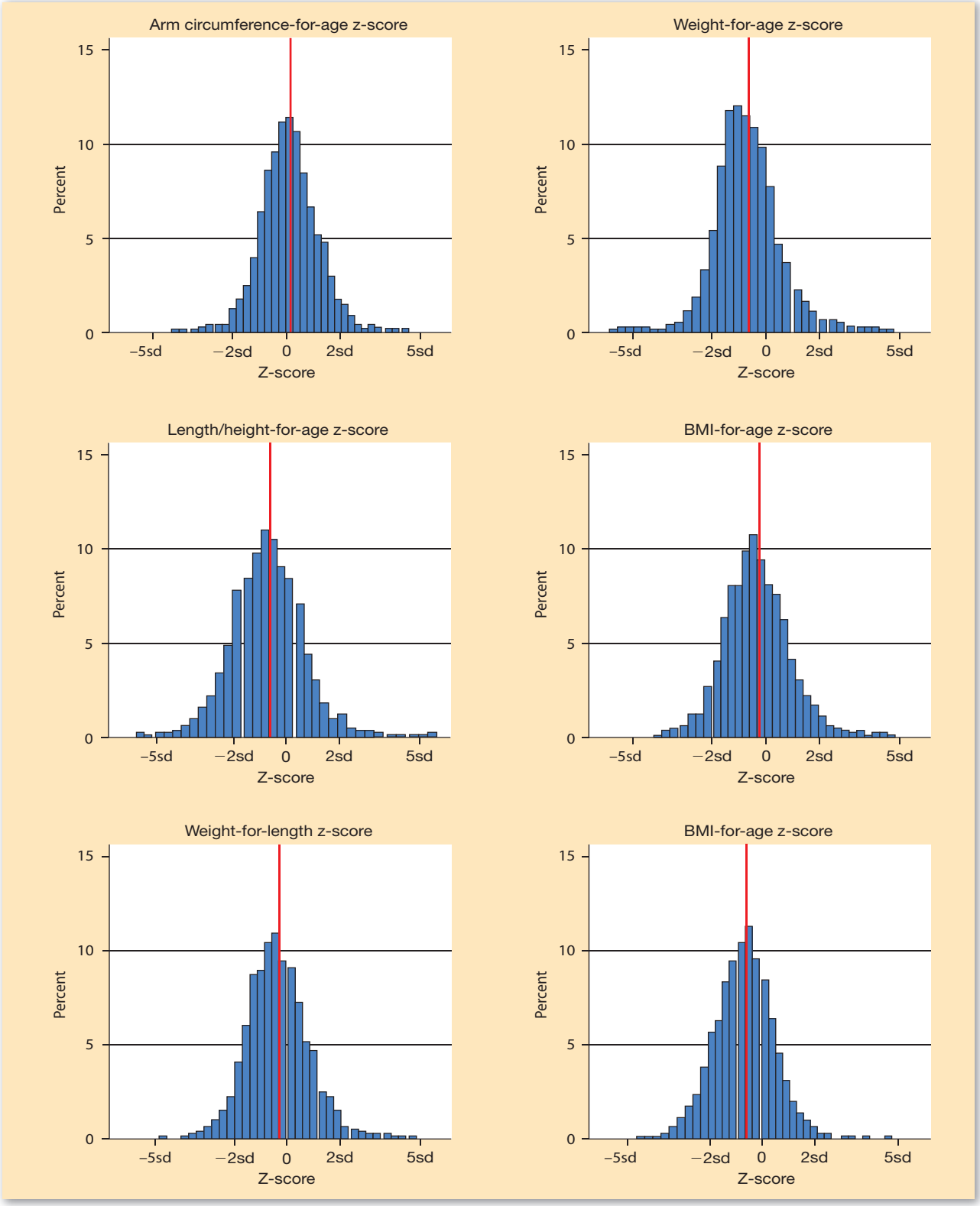


TABLE 18A: CHILD GROWTH MEASURES (Z-SCORES) BY WEALTH QUINTILE (CHILDREN <2)

	Wealth Quintile					
	1st	2nd	3rd	4th	5th	Total
Average arm circumference-for-age Z-score	–0.01	0.18	0.34	0.17	0.60	0.26
Average weight-for-age Z-score	–0.90	–0.64	–0.05	–0.45	–0.31	–0.47
Average length-for-age Z-score	–0.96	–0.73	–0.67	–0.53	–0.42	–0.66
Average body mass index-for-age Z-score	–0.41	–0.19	0.55	–0.17	–0.07	–0.06
Average weight-for-length/height Z-score	–0.56	–0.38	0.47	–0.23	–0.12	–0.16
Average head circumference-for-age Z-score	0.79	–0.75	–0.61	–0.63	0.03	–0.23

TABLE 18B: CHILD GROWTH MEASURES (Z-SCORES) BY PROVINCE (CHILDREN <2)

	Province			
	Hung Yen	Thanh Hoa	Tien Giang	Total
Average arm circumference-for-age Z-score	0.33	0.12	0.29	0.26
Average weight-for-age Z-score	–0.52	–0.29	–0.57	–0.47
Average length-for-age Z-score	–0.73	–0.81	–0.48	–0.66
Average body mass index-for-age Z-score	–0.05	0.33	–0.36	–0.06
Average weight-for-length/height Z-score	–0.16	0.18	–0.43	–0.16
Average head circumference-for-age Z-score	–0.34	0.08	–0.38	–0.23

TABLE 19: CHILD GROWTH MEASURES (Z-SCORES) BY POVERTY STATUS AND ACCESS TO PLACE FOR WASHING HANDS (CHILDREN <2)

	Poor		Access to Place for Washing Hands with Soap and Water (% HHs)		Total
	Yes	No	Yes	No	
Average arm circumference-for-age Z-score	0.18	0.33	0.32	0.00	0.26
Average weight-for-age Z-score	–0.51	–0.43	–0.41	–0.72	–0.47
Average length/height-for-age Z-score	–0.80	–0.52	–0.61	–0.89	–0.66
Average body mass index-for-age Z-score	0.02	–0.13	–0.01	–0.24	–0.06
Average weight-for-length/height Z-score	–0.13	–0.20	–0.12	–0.34	–0.16
Average head circumference-for-age Z-score	–0.10	–0.36	–0.39	0.42	–0.23

population. While still within the healthy range for children under two, those in the lowest wealth quintile exhibit lower weight-for-age (–0.90 SDs lower than median) and length-for-age (–0.96 SDs lower than median).

There are few evident differences in child-growth measures by province, shown in Table 18B. However, the children in the Thanh Hoa sample do appear to be shorter on average (length-for-age of –0.81 SD), heavier on average (weight-for-age of –0.29 SD) and have higher than average body mass index-for-age (+0.33), weight-for-length (+0.18), and head-circumference-for-age (+0.08).

Table 19 presents these same child growth measures disaggregated by poverty status and access to a place for washing hands. There are some intuitive findings regarding the relationship between poverty and nutritional status of children. Children from poor households are found to have lower weight-for-age (–0.51 SD) and length-for-age (–0.80 SD) than children from non-poor households. Children from

poor households also have higher body mass index-for-age (+0.02 SD) and weight-for-length (–0.13 SD) than non-poor households. An important association for the study, we find that all Z-scores are higher for households with a place for washing hands with soap and water than for those without, except for head circumference-for-age.

Figures 3A–3C present scatterplots of the average Z-score for each growth measure disaggregated by age in months and sex. Locally weighted polynomial regression (lowess) estimates are overlaid on the scatterplot to capture the shape of the relationship between age in months and Z-score for male and female children separately. While the survey is a cross section of households, and we cannot observe the evolution of child growth measures over time for the children sampled, we can approximate the trend in early child development for the sample population by analyzing the average Z-scores for children under two years at each age. With the exception of average body mass index-for-age and weight-for-length Z-scores, which appear to level off after around five months of age and hover around the population mean, we find a negative relationship between Z-score and age in months for the remainder of the child growth measures for both males and females. The findings suggest the gap between the sample mean and the reference population median widens as children age from 0–24 months, indicating that the nutritional status of children in the sample deteriorates over time. This growth pattern is typical among children under two in developing countries.[21]

Another notable finding is the absence of a gap between male and female child growth, implying that the physiological needs of young children in the sample are not met differentially as a result of the child's gender. However, it is not evident whether this trend will continue. In the absence of panel data on each child in the sample we cannot know whether the downward trend shown for arm-circumference-for-age, weight-for-age and height-for-age will continue as females reach age two years and beyond.

[21] Victora et al. 2010.

FIGURE 3A: ARM AND HEAD CIRCUMFERENCE Z-SCORES BY SEX AND MONTHS OF AGE (CHILDREN <2)

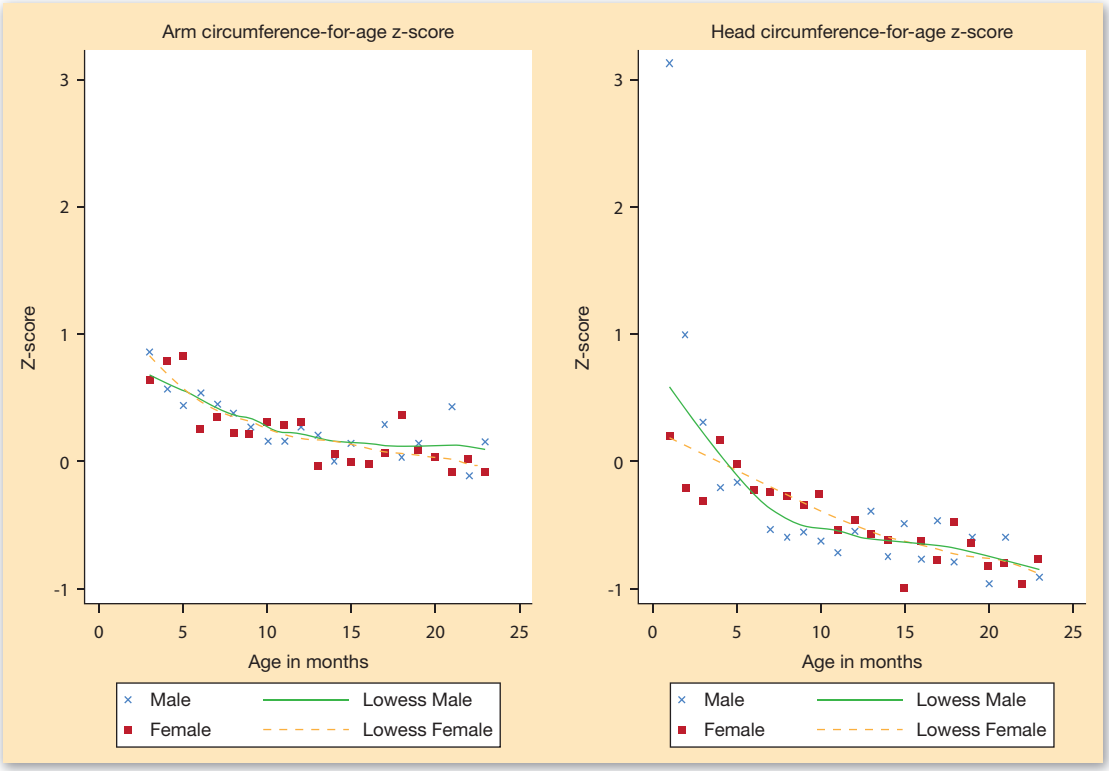


FIGURE 3B: WEIGHT-FOR-AGE AND LENGTH-FOR-AGE Z-SCORES BY SEX AND MONTHS OF AGE (CHILDREN <2)

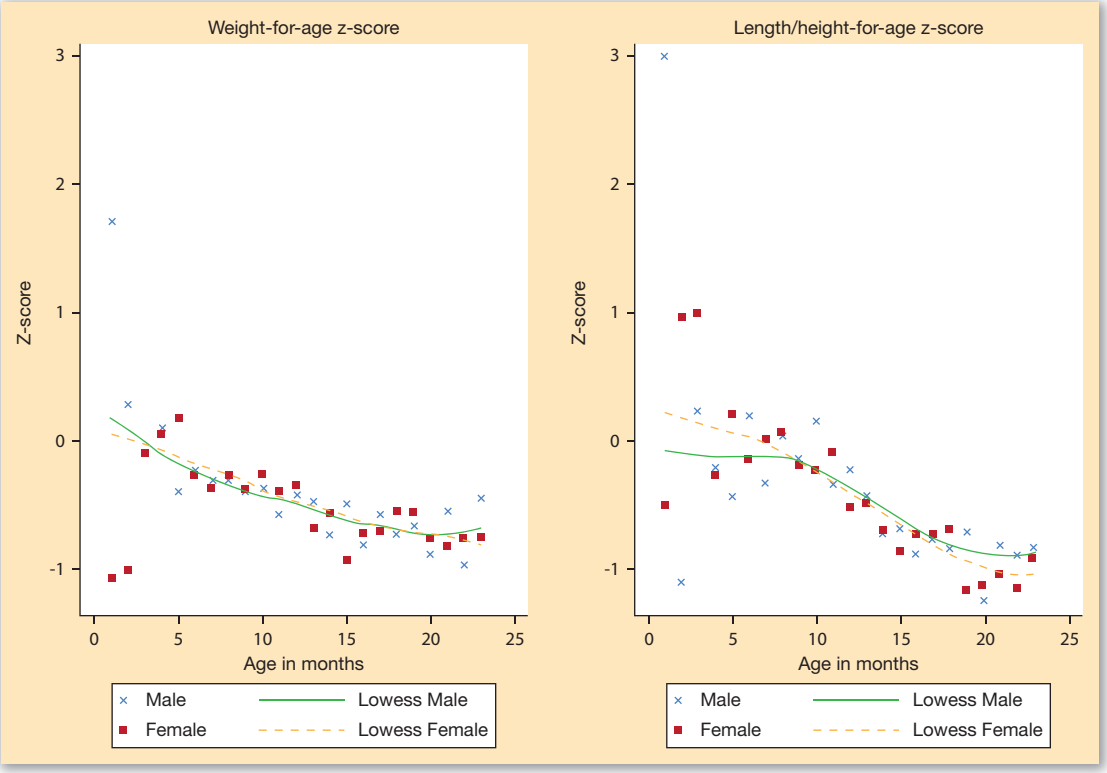
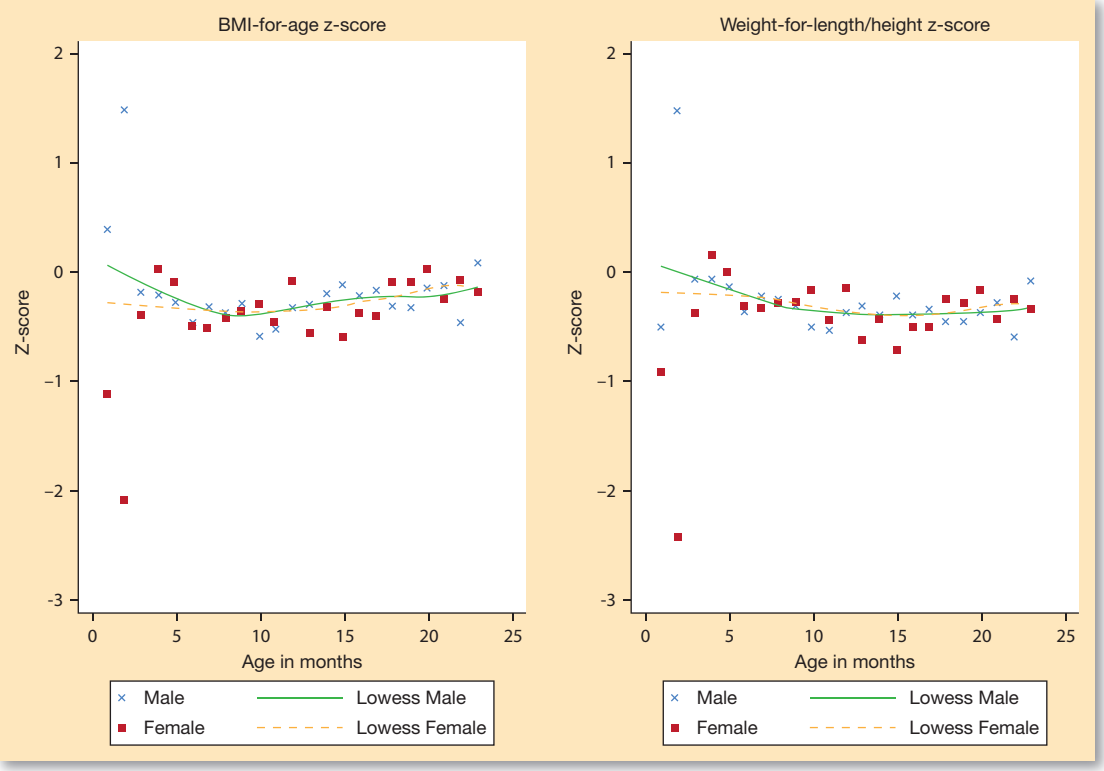


FIGURE 3C: BMI-FOR-AGE AND LENGTH-FOR-HEIGHT Z-SCORES BY SEX AND MONTHS OF AGE (CHILDREN <2)



IV. Conclusion

The findings presented in this report provide a snapshot of baseline characteristics of the target population in regards to household demographics, socioeconomic situation, mother's and other caretaker's handwashing behavior, and key child health and development indicators. Limited baseline knowledge of the critical times for washing hands indicates that there is scope for improving handwashing behavior in the target population, particularly among the poorest. Moreover, while baseline diarrhea and ALRI prevalence are both low in relation to the other Global Scaling Up Handwashing project countries, the poorest are still at a disadvantage, especially with regard to child growth and development.

In addition to providing useful information for the design of the intervention, the data presented here will be used to evaluate the impact of the Vietnam handwashing project on child health and caretaker productivity, and to track changes in handwashing with soap behavior. While the baseline figures on the prevalence of diarrhea and ALRI are good news for the Vietnamese population, they are likely too low to enable detection of an impact of the intervention on diarrhea outcomes. Still, the evaluation study hopes to measure and learn about the impact of the intervention on handwashing behavior change that will be used to guide future projects and policy both in Vietnam and globally.

As outlined in the methodology section, the impact evaluation study utilizes a series of household and community surveys. These include the baseline, four waves of longitudinal monitoring, and post-intervention follow-up questionnaires. At the time of this report's publication, longitudinal data collection is completed, and post-intervention data collection is scheduled to begin by the end of 2010. Data analysis and impact assessments will be conducted soon after, and a full impact evaluation report of the handwashing project will be published by the end of 2011.

References

Baqui, A. H., R. E. Black, M. Yunus, A. R. Hoque, H. R. Chowdhury, R. B. Sack. 1991. "Methodological Issues in Diarrhoeal Diseases Epidemiology: Definition of Diarrhoeal Episodes." *Int J Epidemiol* 20 (4): 1057–63.

Black, R. E., L. H. Allen, Z. A. Bhutta, et al. 2008. "Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences." *The Lancet* 371 (9608): 243–260.

Curtis, V. A., L. O. Danquah, R. V. Aunger. 2009. "Planned, Motivated, and Habitual Hygiene Behavior: An Eleven Country Review." *Health Education Research* 24 (4): 655–73.

Engle, P. L., M. M. Black, J. R. Behrman, et al. 2007. "Strategies to Avoid the Loss of Developmental Potential in More Than 200 Million Children in the Developing World." *The Lancet* 369 (9557): 229–242.

Filmer, D. L., l. Pritchett. 2001. "Estimating Wealth Effects without Expenditure Data—or Tears: An Application to Educational Enrollments in States of India." *Demography* 38 (1): 115–132.

Grantham-McGregor, S., Y. B. Cheung, S. Cueto, P. Glewwe, L. Richter, B. Strupp. 2007. "Developmental Potential in the First 5 Years for Children in Developing Countries." *The Lancet* 369 (9555): 60–70.

Habicht, J. P. 1974. "Estandarización de Métodos Epidemiológicos Cuantitativos sobre el Terreno" ["Standardization of Quantitative Epidemiological Methods in the Field"]. *Bol Oficina Sanit Panam* 76 (5): 375–384.

Hernan, M. A., S. Hernandez-Diaz, J. M. Robins. 2004. "A Structural Approach to Selection Bias." *Epidemiology* 15: 615–625.

Nestel, P. and INACG Steering Committee. 2002. "Adjusting Hemoglobin Values in Program Surveys." Washington, DC: International Life Sciences Institute.

Stoltzfus, R. J., M. L. Dreyfus. 1999. *Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia: A Report of the International Nutritional Anemia Consultative Group (INACG).* Washington, DC: The Nutrition Foundation.

United Nations Development Program. 2010. *Achieving the Millennium Development Goals in an Era of Global Uncertainty. Asia-Pacific Regional Report 2009/10.* Bangkok, Thailand: United Nations.

Victora, C. G., L. Adair, C. Fall, P. C. Hallal, R. Martorell, L. M. Richter. 2008. Maternal and Child Undernutrition: Consequences for Adult Health and Human Capital. *The Lancet* 371 (9609): 340–357.

Victora, C. G., M. de Onis, P. C. Hallal, M. Blössner, R. Shrimpton. 2010. "Worldwide Timing of Growth Faltering: Revisiting Implications for Interventions." *Pediatrics* 125: e473–e480.

Walker, S. P., T. D. Wachs, J. Meeks Gardner, et al. 2007. "Child Development: Risk Factors for Adverse Outcomes in Developing Countries." *The Lancet* 369 (9556): 145–157.

WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation Website. Accessed June 20, 2010. http://www.wssinfo.org/definitions/infrastructure.html.

World Health Organization. 2005. *Pocket Book of Hospital Care for Children: Guidelines for the Management of Common Illnesses with Limited Resources*. Geneva: WHO Press.

World Health Organization. 2006. *WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age: Methods and Development.* Geneva: WHO Press.

World Health Organization. 2007. *WHO Child Growth Standards: Head Circumference-for-Age, Arm Circumference-for-Age, Triceps Skinfold-for-Age and Subscapular Skinfold-for-Age: Methods and Development.* Geneva: WHO Press.

Annex 1: Communes Selected for Handwashing Project IE Sample

TABLE 20A: COMMUNES SELECTED TO RECEIVE TREATMENT 1 (IPC + MASS MEDIA)

No.	Province	District	Commune	Population
1	Hung Yen	An Thi	Bac Son	7,590
2	Hung Yen	An Thi	Bai Say	6,300
3	Hung Yen	An Thi	Thi Tran An Thi	8,310
4	Hung Yen	Kim Dong	Chinh Nghia	6,730
5	Hung Yen	Kim Dong	Ngoc Thanh	6,680
6	Hung Yen	Kim Dong	Thi Tran Luong Bang	9,675
7	Hung Yen	Kim Dong	Tho Vinh	6,825
8	Hung Yen	Kim Dong	Vinh Xa	6,931
9	Hung Yen	Kim Dong	Vu Xa	5,510
10	Hung Yen	Phu Cu	Nhat Quang	5,139
11	Hung Yen	Phu Cu	Phan Sao Nam	5,470
12	Hung Yen	Phu Cu	Thi Tran Tran Cao	5,882
13	Hung Yen	Phu Cu	Tong Tran	7,172
14	Hung Yen	Tien Lu	Hoang Hanh	5,310
15	Hung Yen	Tien Lu	Nhat Tan	8,050
16	Hung Yen	Tien Lu	Tan Hung	5,350
17	Hung Yen	Tien Lu	Thien Phien	7,205
18	Hung Yen	Tien Lu	Trung Dung	6,003
19	Hung Yen	Yen My	Nghia Hiep	6,250
20	Hung Yen	Yen My	Ngoc Long	5,441
21	Hung Yen	Yen My	Tan Viet	8,440
22	Hung Yen	Yen My	Thanh Long	8,416
23	Hung Yen	Yen My	Thi Tran Yen My	13,184
24	Hung Yen	Yen My	Trung Hung	7,240
25	Thanh Hoa	Quang Xuong	Quang Hop	6,342
26	Thanh Hoa	Quang Xuong	Quang Linh	4,213
27	Thanh Hoa	Quang Xuong	Quang Loc	7,215
28	Thanh Hoa	Quang Xuong	Quang Loi	6,783
29	Thanh Hoa	Quang Xuong	Quang Minh	4,577
30	Thanh Hoa	Quang Xuong	Quang Nhan	6,900
31	Thanh Hoa	Quang Xuong	Quang Van	6,192
32	Thanh Hoa	Thach Thanh	Thach Son	6,757
33	Thanh Hoa	Thach Thanh	Thanh Van	6,418

(*Continued*)

TABLE 20A: (Continued)

No.	Province	District	Commune	Population
34	Thanh Hoa	Thach Thanh	Thanh Vinh	6,064
35	Thanh Hoa	Tinh Gia	Binh Minh	6,048
36	Thanh Hoa	Tinh Gia	Hai An	5,783
37	Thanh Hoa	Tinh Gia	Hai Chau	10,000
38	Thanh Hoa	Tinh Gia	Hung Son	4,380
39	Thanh Hoa	Tinh Gia	Tan Dan	5,880
40	Thanh Hoa	Tinh Gia	Truc Lam	6,125
41	Thanh Hoa	Trieu Son	Hop Tien	4,081
42	Thanh Hoa	Trieu Son	Thi Tran Trieu Son	7,741
43	Thanh Hoa	Trieu Son	Tho The	5,022
44	Thanh Hoa	Trieu Son	Xuan Thinh	5,339
45	Tien Giang	Cai Lay	Hoi Xuan	953
46	Tien Giang	Cai Lay	My Hanh Dong	9,134
47	Tien Giang	Cai Lay	My Long	9,549
48	Tien Giang	Cai Lay	My Phuoc Tay	13,318
49	Tien Giang	Cai Lay	My Thanh Nam	13,316
50	Tien Giang	Cai Lay	Phu Nhuan	9,658
51	Tien Giang	Cai Lay	Thi Tran Cai Lay	27,898
52	Tien Giang	Chau Thanh	Diem Hy	10,014
53	Tien Giang	Chau Thanh	Kim Son	10,919
54	Tien Giang	Chau Thanh	Long Dinh	15,768
55	Tien Giang	Chau Thanh	Tan Ly Dong	13,456
56	Tien Giang	Chau Thanh	Thoi Son[22]	6,128
57	Tien Giang	Chau Thanh	Vinh Kim	10,908
58	Tien Giang	Cho Gao	Dang Hung Phuoc	11,499
59	Tien Giang	Cho Gao	Thi Tran Cho Gao	8,938
60	Tien Giang	Go Cong Tay	Dong Thanh	11,683
61	Tien Giang	Go Cong Tay	Thanh Nhut	13,392
62	Tien Giang	Go Cong Tay	Thanh Tri	10,609
63	Tien Giang	Go Cong Tay	Yen Luong	6,889
64	Tien Giang	Tan Phu Dong	Tan Thanh	4,894
65	Tien Giang	Tan Phuoc	Hung Thanh	6,141
66	Tien Giang	Tan Phuoc	Phu My	8,255
67	Tien Giang	Tan Phuoc	Phuoc Lap	890
68	Tien Giang	Tan Phuoc	Tan Lap 1	5,279
69	Tien Giang	Tan Phuoc	Tan Lap 2	2,095
70	Tien Giang	Tan Phuoc	Thanh Hoa	903
	Total			533,449

[22] Baseline data were collected in Thoi Son commune; however, due to a change in administrative boundaries this commune will not be part of the handwashing project intervention (T1).

TABLE 20B: COMMUNES SELECTED TO RECEIVE TREATMENT 2 (IPC + DCC + MASS MEDIA)

No.	Province	District	Commune	Population
1	Hung Yen	An Thi	Hong Quang	6,475
2	Hung Yen	An Thi	Nguyen Trai	6,075
3	Hung Yen	An Thi	Phu Ung	8,190
4	Hung Yen	An Thi	Quang Vinh	1,598
5	Hung Yen	Kim Dong	Hung Cuong	4,060
6	Hung Yen	Kim Dong	Mai Dong	5,615
7	Hung Yen	Kim Dong	Nghia Dan	6,442
8	Hung Yen	Kim Dong	Pham Ngu Lao	7,420
9	Hung Yen	Kim Dong	Toan Thang	10,200
10	Hung Yen	Phu Cu	Doan Dao	9,844
11	Hung Yen	Phu Cu	Minh Hoang	5,154
12	Hung Yen	Phu Cu	Nguyen Hoa	5,012
13	Hung Yen	Tien Lu	An Vien	8,021
14	Hung Yen	Tien Lu	Cuong Chinh	8,215
15	Hung Yen	Tien Lu	Di Che	6,871
16	Hung Yen	Tien Lu	Hai Trieu	5,350
17	Hung Yen	Tien Lu	Minh Phuong	3,510
18	Hung Yen	Tien Lu	Thi Tran Vuong	4,932
19	Hung Yen	Yen My	Lieu Xa	8,679
20	Hung Yen	Yen My	Ly Thuong Kiet	6,166
21	Hung Yen	Yen My	Trung Hoa	11,347
22	Hung Yen	Yen My	Viet Cuong	3,842
23	Hung Yen	Yen My	Yen Hoa	5,596
24	Hung Yen	Yen My	Yen Phu	12,046
25	Thanh Hoa	Quang Xuong	Quang Dai	5,690
26	Thanh Hoa	Quang Xuong	Quang Dinh	5,439
27	Thanh Hoa	Quang Xuong	Quang Dong	4,952
28	Thanh Hoa	Quang Xuong	Quang Giao	4,822
29	Thanh Hoa	Quang Xuong	Quang Hai	9,450
30	Thanh Hoa	Quang Xuong	Quang Khe	7,169
31	Thanh Hoa	Quang Xuong	Quang Long	6,067
32	Thanh Hoa	Quang Xuong	Quang Vong	5,781
33	Thanh Hoa	Thach Thanh	Thanh Tho	5,435
34	Thanh Hoa	Tinh Gia	Hai Nhan	9,435
35	Thanh Hoa	Tinh Gia	Hai Yen	4,020
36	Thanh Hoa	Tinh Gia	Mai Lam	6,120
37	Thanh Hoa	Tinh Gia	Tinh Hai	6,282
38	Thanh Hoa	Trieu Son	An Nong	6,375

(Continued)

TABLE 20B: (Continued)

No.	Province	District	Commune	Population
39	Thanh Hoa	Trieu Son	Tan Ninh	10,505
40	Thanh Hoa	Trieu Son	Tho Ngoc	7,284
41	Thanh Hoa	Trieu Son	Tho Tan	5,022
42	Thanh Hoa	Trieu Son	Tho Tien	5,562
43	Thanh Hoa	Trieu Son	Tho Vuc	4,915
44	Thanh Hoa	Trieu Son	Van Son	7,137
45	Tien Giang	Cai Lay	Binh Phu	17,284
46	Tien Giang	Cai Lay	Cam Son	8,892
47	Tien Giang	Cai Lay	Long Khanh	13,375
48	Tien Giang	Cai Lay	Long Tien	12,328
49	Tien Giang	Cai Lay	Long Trung	12,983
50	Tien Giang	Cai Lay	My Hanh Trung	7,763
51	Tien Giang	Cai Lay	Tan Hoi	12,256
52	Tien Giang	Cai Lay	Tan Phong	13,928
53	Tien Giang	Cai Lay	Thanh Hoa	5,794
54	Tien Giang	Chau Thanh	Ban Long	893
55	Tien Giang	Chau Thanh	Binh Trung	8,947
56	Tien Giang	Chau Thanh	Long An	13,104
57	Tien Giang	Chau Thanh	Phuoc Thanh[23]	9,689
58	Tien Giang	Chau Thanh	Song Thuan	5,908
59	Tien Giang	Chau Thanh	Thi Tran Tan Hiep	5,939
60	Tien Giang	Cho Gao	An Thanh Thuy	13,443
61	Tien Giang	Cho Gao	Hoa Tinh	5,806
62	Tien Giang	Cho Gao	My Tinh An	9,206
63	Tien Giang	Cho Gao	Phu Kiet	10,721
64	Tien Giang	Cho Gao	Tan Binh Thanh	7,705
65	Tien Giang	Cho Gao	Tan Thuan Binh	10,416
66	Tien Giang	Go Cong Tay	Dong Son	10,178
67	Tien Giang	Go Cong Tay	Long Binh	13,457
68	Tien Giang	Go Cong Tay	Thanh Cong	4,690
69	Tien Giang	Tan Phu Dong	Phu Tan	3,643
70	Tien Giang	Tan Phuoc	My Phuoc	2,653
	Total			529,123

[23] Baseline data were collected in Phuoc Thanh commune; however, due to a change in administrative boundaries this commune will not be part of the handwashing project intervention (T2).

TABLE 20C: COMMUNES SELECTED TO SERVE AS CONTROL (MASS MEDIA)

No.	Province	District	Commune	Population
1	Hung Yen	An Thi	Cam Ninh	4,650
2	Hung Yen	An Thi	Ha Le	5,090
3	Hung Yen	An Thi	Ho Tung Mau	7,690
4	Hung Yen	An Thi	Hoang Hoa Tham	6,220
5	Hung Yen	An Thi	Hong Van	5,310
6	Hung Yen	Kim Dong	Dong Thanh	6,059
7	Hung Yen	Kim Dong	Duc Hop	7,969
8	Hung Yen	Kim Dong	Hiep Cuong	7,835
9	Hung Yen	Kim Dong	Nhan La	3,856
10	Hung Yen	Kim Dong	Phu Thinh	6,450
11	Hung Yen	Kim Dong	Song Mai	6,750
12	Hung Yen	Phu Cu	Dinh Cao	11,361
13	Hung Yen	Phu Cu	Minh Tan	5,648
14	Hung Yen	Phu Cu	Minh Tien	5,537
15	Hung Yen	Phu Cu	Tam Da	5,399
16	Hung Yen	Phu Cu	Tien Tien	3,741
17	Hung Yen	Tien Lu	Hung Dao	8,135
18	Hung Yen	Tien Lu	Le Xa	6,653
19	Hung Yen	Tien Lu	Ngo Quyen	5,907
20	Hung Yen	Tien Lu	Phuong Chieu	3,805
21	Hung Yen	Tien Lu	Thu Sy	9,205
22	Hung Yen	Tien Lu	Thuy Loi	7,815
23	Hung Yen	Yen My	Dong Than	9,588
24	Hung Yen	Yen My	Mihn Chau	4,460
25	Thanh Hoa	Quang Xuong	Quang Chau	8,092
26	Thanh Hoa	Quang Xuong	Quang Chinh	7,960
27	Thanh Hoa	Quang Xuong	Quang Duc	6,499
28	Thanh Hoa	Quang Xuong	Quang Ninh	6,518
29	Thanh Hoa	Quang Xuong	Quang Phong	7,175
30	Thanh Hoa	Quang Xuong	Quang Phu	7,070
31	Thanh Hoa	Quang Xuong	Quang Tan	9,430
32	Thanh Hoa	Quang Xuong	Quang Yen	6,808
33	Thanh Hoa	Thach Thanh	Thach Binh	7,205
34	Thanh Hoa	Thach Thanh	Thach Dong	5,267
35	Thanh Hoa	Thach Thanh	Thanh Truc	5,915
36	Thanh Hoa	Tinh Gia	Anh Son	5,133
37	Thanh Hoa	Tinh Gia	Ngoc Linh	6,002
38	Thanh Hoa	Tinh Gia	Nguyen Binh	9,725

(Continued)

TABLE 20C: (Continued)

No.	Province	District	Commune	Population
39	Thanh Hoa	Tinh Gia	Tan Truong	7,600
40	Thanh Hoa	Trieu Son	Dan Ly	8,709
41	Thanh Hoa	Trieu Son	Tho Binh	8,125
42	Thanh Hoa	Trieu Son	Tho Cuong	5,049
43	Thanh Hoa	Trieu Son	Tho Phu	4,581
44	Thanh Hoa	Trieu Son	Trieu Thanh	5,844
45	Tien Giang	Cai Lay	My Thanh Bac	8,212
46	Tien Giang	Cai Lay	Ngu Hiep	15,898
47	Tien Giang	Cai Lay	Nhi My	6,848
48	Tien Giang	Cai Lay	Nhi Quy	11,538
49	Tien Giang	Cai Lay	Phu Cuong	1,328
50	Tien Giang	Cai Lay	Phu Quy	671
51	Tien Giang	Cai Lay	Tan Phu	5,995
52	Tien Giang	Cai Lay	Thanh Loc	12,274
53	Tien Giang	Chau Thanh	Binh Duc	13,968
54	Tien Giang	Chau Thanh	Dong Hoa	9,158
55	Tien Giang	Chau Thanh	Nhi Binh	17,362
56	Tien Giang	Chau Thanh	Tan Hiep	14,587
57	Tien Giang	Chau Thanh	Thanh Phu	7,924
58	Tien Giang	Chau Thanh	Tna Huong	15,791
59	Tien Giang	Cho Gao	Binh Ninh	11,430
60	Tien Giang	Cho Gao	Long Binh Dien	12,320
61	Tien Giang	Cho Gao	Song Binh	9,413
62	Tien Giang	Cho Gao	Trugn Hoa	6,432
63	Tien Giang	Cho Gao	Xuan Dong	9,311
64	Tien Giang	Go Cong Tay	Binh Nhi	12,654
65	Tien Giang	Go Cong Tay	Binh Tan	11,025
66	Tien Giang	Go Cong Tay	Vinh Binh Town	14,068
67	Tien Giang	Tan Phuoc	My Phuoc Town	2,762
68	Tien Giang	Tan Phuoc	Tan Hoa Tay	409
69	Tien Giang	Tan Phuoc	Thanh My	2,040
70	Tien Giang	Tan Phuoc	Thanh Tan	1,351
				528,609

Annex 2: Baseline Comparison of Means Tests for Balance

As mentioned in Section II: Methodology, a critical requirement of the IE methodology is that a robust counterfactual for the treatment group can be approximated. The households surveyed possess many characteristics that are either unobservable, or for which data were not collected, and thus balance between the groups on these unobservable characteristics cannot be tested. However, if a sufficiently large number of observed characteristics are found to be balanced across the treatment and control groups, then we can be reasonably confident that the unobserved characteristics are balanced as well.

Shown below are a series of tables presenting the mean comparison tests[24] across treatment and control groups for key variables included in the baseline survey. The null hypothesis of equality of means was rejected at the 10% level in 9.5 percent of the tests on key characteristics (12 out of 127 tests) for Treatment 1 vs. Control. A key difference to note is that in the Treatment 1 group, households were significantly less likely to report washing their hands with soap during the last 24 hours when compared with the Control group ($p = 0.087$). For the comparison between Treatment 2 vs. Control the null hypothesis of equality of means was rejected at the 10% level in 7.1 percent of the tests on key characteristics (9 out of 127 tests). One of the notable differences is the significantly lower length/height-for-age Z-score found in the Treatment 2 group when compared with the Control group. There are significant differences between Treatment 2 and Control groups on both two-day and seven-day diarrhea prevalence, however since the prevalence figures are so low across all households sampled these findings do no generate concern for the study balance.

[24] The standard errors used in the comparison of means tests were clustered at the district level, allowing the possibility of intra-district correlation.

TABLE 21A: COMPARISON OF MEANS TESTS FOR HOUSEHOLD DEMOGRAPHICS

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
HH size	1050	4.630	0.060	0.795	1050	4.630	0.059	0.793	1050	4.609	0.059
Number children under five years age (per HH)	1050	1.173	0.015	0.229	1050	1.199	0.015	0.966	1050	1.200	0.017
Age of HH head	1050	41.457	0.723	0.316	1050	42.688	0.713	0.849	1050	42.492	0.737
Age of other HH members	3806	19.313	0.358	0.499	3808	19.347	0.321	0.426	3788	18.997	0.300
HH head is male	1050	0.880	0.016	0.331	1050	0.862	0.014	0.886	1050	0.859	0.014
Other HH members are male	3831	0.370	0.008	0.965	3839	0.376	0.007	0.637	3818	0.371	0.008
HH head ever attended school	1041	0.981	0.005	0.466	1034	0.980	0.006	0.412	1032	0.985	0.004
Other HH members ever attended school	2503	0.990	0.003	0.140	2461	0.986	0.003	0.657	2481	0.984	0.003
Educational Attainment of HH Head:											
Incomplete primary	1012	0.144	0.016	0.759	999	0.158	0.017	0.756	993	0.151	0.015
Complete primary	1012	0.430	0.020	0.316	999	0.410	0.020	0.781	993	0.403	0.018
Incomplete secondary	1012	0.243	0.017	0.170	999	0.235	0.017	0.089	993	0.279	0.020
Complete secondary	1012	0.111	0.012	0.301	999	0.147	0.017	0.381	993	0.129	0.012
Higher	1012	0.072	0.012	0.015	999	0.049	0.010	0.353	993	0.038	0.007
Educational Attainment of Other HH Members:											
Incomplete primary	2437	0.211	0.010	0.193	2376	0.201	0.009	0.538	2380	0.192	0.010
Complete primary	2437	0.358	0.012	0.954	2376	0.351	0.014	0.780	2380	0.357	0.015
Incomplete secondary	2437	0.239	0.011	0.261	2376	0.249	0.013	0.636	2380	0.258	0.013
Complete secondary	2437	0.132	0.009	0.644	2376	0.142	0.011	0.834	2380	0.139	0.011
Higher	2437	0.060	0.008	0.596	2376	0.057	0.008	0.800	2380	0.054	0.007

TABLE 21B: COMPARISON OF MEANS TESTS FOR HOUSEHOLD PRIMARY WORK, LABOR INCOME, AND NON-LABOR INCOME

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
HH head is employed	1045	0.869	0.013	0.577	1039	0.846	0.015	0.539	1046	0.859	0.013
Others in HH are employed	1967	0.747	0.016	0.813	1998	0.762	0.016	0.709	1981	0.753	0.019
Females in HH are employed	1593	0.702	0.021	0.963	1606	0.699	0.022	0.939	1602	0.701	0.022
Last Week Activity—Unemployed HH Head:											
Studying	136	0.000	0.000	0.322	160	0.019	0.011	0.355	147	0.007	0.007
Taking care of home	136	0.316	0.047	0.274	160	0.431	0.061	0.567	147	0.388	0.045
Rent earner	136	0.044	0.025	0.809	160	0.019	0.013	0.336	147	0.054	0.035
Permanently unable to work	136	0.125	0.045	0.041	160	0.100	0.040	0.089	147	0.027	0.016
Retired	136	0.199	0.038	0.567	160	0.213	0.041	0.752	147	0.231	0.043
Not working	136	0.316	0.054	0.759	160	0.219	0.056	0.347	147	0.293	0.055
Last Week Activity—Unemployed Other HH Members:											
Looking for work	495	0.014	0.006	0.638	469	0.015	0.007	0.722	487	0.018	0.007
Studying	495	0.164	0.023	0.526	469	0.173	0.025	0.728	487	0.185	0.024
Taking care of home	495	0.630	0.039	0.418	469	0.635	0.039	0.367	487	0.585	0.039
Rent earner	495	0.010	0.005	0.230	469	0.013	0.009	0.333	487	0.031	0.016
Permanently unable to work	495	0.016	0.005	0.812	469	0.030	0.010	0.377	487	0.018	0.008
Retired	495	0.034	0.012	0.441	469	0.032	0.011	0.348	487	0.047	0.012
Not working	495	0.131	0.028	0.668	469	0.102	0.028	0.739	487	0.115	0.025
Primary Employment Status (% All Employed Individuals):											
Self-employed	2474	0.067	0.012	0.777	2502	0.068	0.009	0.791	2505	0.072	0.013
Employee	2474	0.248	0.016	0.820	2502	0.240	0.017	0.932	2505	0.242	0.018
Employer or boss	2474	0.004	0.002	0.987	2502	0.004	0.002	0.899	2505	0.004	0.003
Worker with no remuneration	2474	0.000	0.000	0.316	2502	0.000	0.000	0.316	2505	0.000	0.000
Day laborer	2474	0.052	0.009	0.890	2502	0.049	0.010	0.934	2505	0.050	0.010
Working in household activities or production	2474	0.624	0.022	0.985	2502	0.632	0.025	0.830	2505	0.624	0.027
Other	2474	0.005	0.002	0.687	2502	0.006	0.002	0.889	2505	0.006	0.002
Monthly salary (in VND millions)	928	2.229	0.188	0.650	903	1.954	0.094	0.585	930	2.092	0.234
Months worked per year	2485	9.365	0.169	0.731	2506	8.967	0.184	0.218	2498	9.281	0.177
Days worked per month	2485	21.095	0.320	0.398	2505	19.357	0.436	0.026	2497	20.666	0.396
Hours worked per day	2485	7.582	0.101	0.998	2499	7.445	0.111	0.357	2490	7.583	0.100
HH has non-labor income	1050	0.790	0.026	0.170	1050	0.747	0.030	0.736	1050	0.731	0.034
Total HH non-labor income (in VND millions)	802	2.5	0.6	0.419	766	3.0	0.6	0.664	743	3.6	1.3

TABLE 21C: COMPARISON OF MEANS TESTS FOR HOUSEHOLD ASSETS

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
Radio, CD, cassette	1049	0.086	0.013	0.262	1050	0.096	0.014	0.559	1049	0.108	0.014
Television	1050	0.914	0.012	0.859	1050	0.935	0.009	0.100	1050	0.911	0.011
Videocassette, VCR, DVD player	1050	0.594	0.027	0.715	1050	0.630	0.025	0.537	1050	0.608	0.025
Computer	1050	0.071	0.012	0.662	1050	0.054	0.008	0.407	1050	0.065	0.009
Bicycle	1050	0.733	0.032	0.409	1050	0.767	0.025	0.960	1050	0.769	0.029
Motorcycle	1050	0.804	0.017	0.114	1050	0.787	0.017	0.399	1050	0.767	0.017
Automobile or truck	1050	0.023	0.005	0.506	1050	0.030	0.006	0.716	1049	0.028	0.005
Refrigerator	1050	0.278	0.023	0.282	1050	0.253	0.020	0.829	1050	0.248	0.017
Gas stove	1050	0.451	0.028	0.508	1050	0.459	0.028	0.379	1050	0.427	0.024
Blender	1050	0.310	0.025	0.575	1050	0.280	0.024	0.761	1050	0.290	0.025
Microwave	1050	0.017	0.006	0.082	1050	0.015	0.005	0.117	1050	0.007	0.002
Washing machine	1050	0.089	0.016	0.283	1050	0.075	0.012	0.666	1050	0.069	0.010
Water boiler, hot water heater	1050	0.254	0.033	0.003	1050	0.213	0.032	0.047	1050	0.136	0.022
Machinery, equipment for household business	1050	0.023	0.007	0.761	1050	0.022	0.008	0.701	1050	0.026	0.006
Boat	1050	0.042	0.014	0.122	1050	0.017	0.006	0.809	1050	0.019	0.006
Telephone (including mobile)	1050	0.758	0.026	0.737	1050	0.782	0.021	0.282	1050	0.746	0.026
Air conditioner	1050	0.006	0.003	0.348	1050	0.015	0.005	0.297	1050	0.010	0.003
Electric fan	1050	0.956	0.008	0.536	1050	0.957	0.010	0.533	1050	0.949	0.009
HH owns other piece of land	1050	0.190	0.035	0.622	1050	0.185	0.033	0.705	1050	0.168	0.030
HH owns farm equipment	1050	0.190	0.027	0.409	1050	0.187	0.026	0.366	1050	0.223	0.030
HH has animals	1050	0.609	0.037	0.312	1050	0.635	0.035	0.595	1050	0.663	0.039
Number of different kinds of livestock owned per HH	1050	1.036	0.078	0.401	1050	1.050	0.074	0.465	1050	1.129	0.077

TABLE 21D: COMPARISON OF MEANS TESTS FOR HANDWASHING BEHAVIOR

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
Washed hands with soap during the last 24 hours	1051	0.927	0.019	0.087	1051	0.935	0.020	0.200	1054	0.963	0.009
Washed Hands with Soap During the Last 24 Hours in the Following Instances:											
After using the toilet	1051	0.500	0.036	0.345	1051	0.461	0.039	0.856	1054	0.452	0.038
After cleaning child's bottom	1051	0.264	0.037	0.066	1051	0.328	0.041	0.519	1054	0.366	0.042
Before preparing food or cooking	1051	0.333	0.039	0.862	1051	0.275	0.036	0.358	1054	0.324	0.038
Before feeding children	1051	0.349	0.031	0.892	1051	0.294	0.035	0.230	1054	0.356	0.038
HWWS all critical times	1051	0.067	0.024	0.220	1051	0.048	0.018	0.067	1054	0.118	0.034
Because they look or feel dirty	1051	0.461	0.043	0.666	1051	0.477	0.047	0.874	1054	0.487	0.043
After or while doing laundry	1051	0.441	0.049	0.345	1051	0.410	0.048	0.155	1054	0.506	0.047
During at least one critical time	1051	0.788	0.026	0.964	1051	0.777	0.029	0.736	1054	0.789	0.021

TABLE 21E: COMPARISON OF MEANS TESTS FOR HANDWASHING FACILITIES

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
Place to HW in HH with S&W present	1050	0.794	0.028	0.556	1050	0.811	0.029	0.884	1050	0.817	0.027
Place to HW before food preparation area with S&W present	1050	0.290	0.033	0.983	1050	0.296	0.028	0.868	1050	0.290	0.029
Place to HW after using toilet with S&W present	1050	0.775	0.029	0.531	1050	0.794	0.030	0.887	1050	0.800	0.027
HH handwashing after using toilet	1046	0.982	0.006	0.719	1047	0.984	0.005	0.569	1047	0.978	0.009
Location of Handwashing Device, Toilet:											
Inside toilet facility	1027	0.242	0.030	0.638	1028	0.236	0.027	0.734	1024	0.224	0.026
Inside food preparation area	1027	0.057	0.018	0.133	1028	0.046	0.016	0.331	1024	0.028	0.008
Wash basin in yard, less than 1 meter from toilet facility	1027	0.171	0.037	0.962	1028	0.153	0.034	0.741	1024	0.169	0.035
Pond or stream in yard, less than 1 meter from toilet facility	1027	0.004	0.002	0.702	1028	0.003	0.002	0.996	1024	0.003	0.002
Wash basin in yard, between 1 and 3 meters from toilet facility	1027	0.094	0.023	0.469	1028	0.103	0.019	0.618	1024	0.117	0.021
Pond or stream in yard, between 1 and 3 meters from toilet facility	1027	0.009	0.004	0.743	1028	0.006	0.004	0.868	1024	0.007	0.004
Type of Handwashing Device, Toilet:											
Tap, faucet	926	0.253	0.038	0.332	933	0.257	0.040	0.381	924	0.310	0.044
Homemade water tap	926	0.414	0.044	0.806	933	0.449	0.049	0.776	924	0.430	0.048
Basin, bucket	926	0.215	0.033	0.191	933	0.195	0.030	0.377	924	0.160	0.026
Other	926	0.015	0.006	0.144	933	0.005	0.004	0.992	924	0.005	0.004
Water is available at the place for washing hands, toilet	911	0.981	0.006	0.789	927	0.980	0.009	0.966	907	0.979	0.006
Soaps Available at the Place for Washing Hands, Toilet:											
Bar soap	929	0.479	0.031	0.164	934	0.511	0.031	0.554	925	0.534	0.024
Liquid, dishwashing liquid soap	929	0.157	0.025	0.145	934	0.208	0.036	0.816	925	0.219	0.035
Powder soap, laundry detergent	929	0.635	0.041	0.106	934	0.694	0.038	0.583	925	0.722	0.035
No soap observed	929	0.087	0.021	0.117	934	0.077	0.023	0.279	925	0.048	0.014

(*Continued*)

TABLE 21E: (Continued)

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
Ash, Mud Available at the Place for Washing Hands, Toilet:											
Ash	885	0.003	0.002	0.055	899	0.012	0.005	0.743	887	0.015	0.006
Mud	885	0.051	0.017	0.128	899	0.036	0.012	0.336	887	0.021	0.008
Ash and Mud	885	0.025	0.012	0.815	899	0.032	0.011	0.440	887	0.021	0.008
Neither ash nor mud observed	885	0.921	0.024	0.452	899	0.920	0.020	0.370	887	0.943	0.016
HH handwashing before/ after cooking or feeding a child	1045	0.965	0.010	0.710	1044	0.966	0.009	0.802	1047	0.969	0.008
Location of Handwashing Device, Food Preparation:											
Inside toilet facility	1008	0.033	0.008	0.678	1007	0.030	0.009	0.524	1015	0.037	0.008
Inside food preparation area	1008	0.184	0.026	0.092	1007	0.161	0.028	0.331	1015	0.127	0.021
Type of Handwashing Device, Food Preparation:											
Tap, faucet	345	0.446	0.058	0.675	336	0.452	0.059	0.730	330	0.482	0.062
Container from which water is poured	345	0.130	0.032	0.008	336	0.057	0.019	0.439	330	0.039	0.012
Other	345	0.423	0.061	0.536	336	0.491	0.060	0.890	330	0.479	0.065
Water is available at the place for washing hands, food preparation	346	0.983	0.010	0.948	336	0.976	0.013	0.691	331	0.982	0.007
Soaps Available at the Place for Washing Hands, Food Preparation:											
Bar soap	346	0.480	0.055	0.495	336	0.607	0.045	0.274	331	0.532	0.053
Liquid, dishwashing liquid soap	346	0.246	0.055	0.109	336	0.307	0.065	0.407	331	0.384	0.067
Powder soap, laundry detergent	346	0.572	0.053	0.422	336	0.646	0.051	0.917	331	0.637	0.062
No soap observed	346	0.075	0.021	0.495	336	0.045	0.017	0.726	331	0.054	0.022
Ash, Mud Available at the Place for Washing Hands, Toilet:											
Ash	331	0.003	0.003	0.541	320	0.003	0.003	0.557	316	0.006	0.004
Mud	331	0.076	0.037	0.066	320	0.041	0.021	0.117	316	0.006	0.004
Ash and Mud	331	0.027	0.008	0.023	320	0.028	0.016	0.187	316	0.006	0.004
Neither ash nor mud observed	331	0.894	0.041	0.040	320	0.928	0.025	0.047	316	0.981	0.009

TABLE 21F: COMPARISON OF MEANS TESTS FOR ACUTE LOWER RESPIRATORY INFECTION AND DIARRHEA SYMPTOMS PREVALENCE (% CHILDREN < 5)

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
ALRI in previous 48 hours	1061	0.006	0.003	0.797	1076	0.003	0.002	0.262	1057	0.007	0.003
ALRI in previous three days	1061	0.006	0.003	0.314	1076	0.006	0.003	0.321	1057	0.010	0.004
Diarrhea in previous 48 hrs	1061	0.008	0.003	0.358	1076	0.002	0.001	0.007	1057	0.011	0.003
Diarrhea in previous week	1061	0.013	0.003	0.493	1076	0.005	0.002	0.011	1057	0.017	0.004
Anemic: Hb level < 11 g/dl	984	0.312	0.021	0.828	1011	0.331	0.021	0.391	979	0.305	0.022

TABLE 21G: COMPARISON OF MEANS TESTS FOR CHILD GROWTH MEASURES (Z-SCORES)

	Treatment 1				Treatment 2				Control		
	N	Avg.	SE	p-value	N	Avg.	SE	p-value	N	Avg.	SE
BMI-for-age Z-score	1035	–0.222	0.055	0.345	1056	–0.253	0.045	0.557	1030	–0.295	0.055
Head circumference-for-age Z-score	1054	–0.650	0.049	0.316	1066	–0.614	0.053	0.635	1050	–0.579	0.051
Length/height-for-age Z-score	1043	–0.724	0.064	0.139	1061	–0.747	0.063	0.083	1043	–0.584	0.070
Arm circumference-for-age Z-score	1050	0.124	0.048	0.491	1060	0.120	0.054	0.480	1051	0.172	0.050
Weight-for-length/height Z-score	1051	–0.310	0.051	0.429	1067	–0.335	0.042	0.641	1043	–0.365	0.049
Weight-for-age Z-score	1046	–0.632	0.043	0.276	1064	–0.632	0.043	0.275	1045	–0.565	0.045

Annex 3: Comparison between WSP IE Baseline Survey and VNDHS Survey

The experimental group for the handwashing project impact evaluation was designed with the primary intention of producing internally valid estimates of program impacts under the unique constraints of the handwashing project, and is not intended to be suitable for computing country, province, or commune level population statistics without additional assumptions. The experimental group is not a representative sample of the Vietnamese population for several reasons. First, the experimental group includes only three out of a total of 61 provinces, and 15 out of a total of approximately 600 districts in Vietnam. These 15 districts were conveniently and purposively selected due to their suitability for the intervention and willingness to participate in the study. Furthermore, within the districts chosen, only those communes with an active Vietnam Women's Union were eligible to participate in the study. Finally, the experimental group comprises only those households with a child under the age of two at the time of the survey. These factors imply that causal inferences of the treatment on outcomes are limited to the experimental group.

Here we present a comparison of basic characteristics of the Vietnamese population using the 2002 Vietnam Demographic Health Survey (VNDHS)[25] with characteristics of the individuals included in the WSP IE survey subsample. We concentrate on three groups of variables: demographics, educational attainment, and household wealth measured by an asset index.

Table 22 presents the basic demographics for the two sample populations. The large proportion of children between 0 and 4 years and household members from 25 to 35 are evidence of the WSP study sample selection restriction to mothers/caretakers of children under five years old. On average, the individuals interviewed in the WSP survey are 24.2 years old, whereas the average age of the VNDHS sample is 28.8 years. While the average number of children under the age of five per household is 0.49 in the VNDHS, this figure is 1.19 in the WSP survey, again a likely factor of the unique sample selection of the WSP survey.

TABLE 22: DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLD RESPONDENTS IN WSP SURVEY AND VNDHS

	WSP Survey	VNDHS
Age:		
0–4	25.8%	7.3%
5–9	6.8%	10.0%
10–14	3.8%	12.5%
15–19	3.0%	11.2%
20–24	9.3%	8.0%
25–29	15.9%	7.5%
30–34	10.9%	7.6%
35–39	5.8%	7.6%
40–44	2.9%	7.3%
45–49	2.7%	5.5%
50+	13.1%	15.6%
Average age	24.2	28.8
Age Distribution of Children Under Five (% per HH):		
Under 12 months	26.5%	17.6%
12–23 mo	44.8%	21.6%
24–35 mo	18.2%	20.5%
36–47 mo	5.0%	19.1%
48–59 mo	5.4%	21.3%
Average age of under five	2.18	2.05
Total Number of Children Under Five (% HHs):		
0	0.0%	62.0%
1	81.6%	28.6%
2	17.8%	7.9%
3	0.6%	1.2%
4	0.0%	0.3%
5	0.0%	0.0%
Average number of children under five in HH	1.19	0.49

[25] The population considered in the VNDHS was selected following the restriction of age imposed by the WSP IE survey for each group of questions.

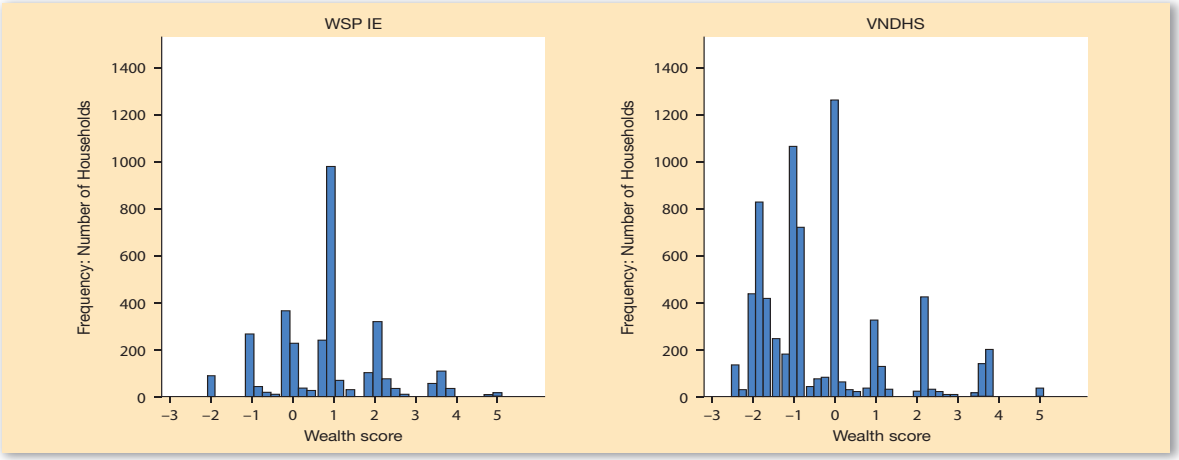
Table 23 summarizes the educational attainment of the household population by age group. The Vietnamese formal educational system is divided into three tiers, known as the five-four-three system. Individuals complete five years of primary, four years of lower secondary, and three years of higher secondary education. Graduates of higher secondary school may then pursue higher education through university, colleges, or technical schools. Overall there are no major differences in educational attainment between the two samples, although the WSP survey contains a lower proportion of uneducated individuals (1.5%), compared with the VNDHS average of 8.3%, shown in the lower half of the table.

A final comparison between the WSP IE survey and the VNDHS is made on the socioeconomic makeup of the samples using an asset-based index of household wealth. An asset-based wealth index was chosen as the key socioeconomic indicator over an income or expenditure based measure since household asset ownership is a more stable measure of household wealth and is less susceptible to short-term shocks.

In order to make a valid comparison between socioeconomic status across different surveys the data sets were pooled, and an asset index was created using ownership of durable goods common to both samples. The procedure uses principal components analysis (PCA)[26] to assign weights to each asset indicator variable, which are then applied to the separate samples to estimate the wealth of each household.[27] The durable goods included in the index are radio, television, refrigerator, bicycle, motorcycle/motor scooter, car, telephone, washing machine, boat, and plowing machine.

The distribution of wealth scores for the WSP survey and the VNDHS samples are shown in Figure 4. The wealth score places the household along a continuum of wealth from poorest to wealthiest. As illustrated in the leftmost graph, wealth scores in the WSP survey are approximately normally distributed with a mean of 0.84, while in the VNDHS sample the distribution is skewed to the left with a mean of –0.38, indicating households in the sample are poorer on average. There are several potential explanations for this pattern. First, the VNDHS survey was administered in 2002 and since this time Vietnam has experienced rapid economic growth and poverty reduction. Second, while the VNDHS is a nationally representative sample, the WSP survey is not a representative sample of the Vietnamese population, but rather the target population of the handwashing project.

FIGURE 4: DISTRIBUTION OF WEALTH SCORES FOR THE WSP SURVEY AND VNDHS



[26] Filmer and Pritchett 2001.

[27] The WSP IE survey wealth index used elsewhere in this report is constructed using only the WSP IE survey sample. It contains household ownership of durable goods, land and agricultural equipment, and livestock.

TABLE 23: EDUCATIONAL ATTAINMENT OF HOUSEHOLD POPULATION IN WSP SURVEY AND VNDHS

Age Group	No Education	Incomplete Primary	Complete Primary	Incomplete Secondary	Complete Secondary	Higher	Total
WSP Survey:							
5–9	2.8%	93.0%	3.9%	0.1%	0.2%	0.0%	100.0%
10–14	0.6%	7.4%	79.6%	12.5%	0.0%	0.0%	100.0%
15–19	0.5%	1.9%	14.4%	58.4%	20.8%	4.0%	100.0%
20–24	0.5%	4.3%	29.0%	36.0%	23.8%	6.4%	100.0%
25–29	0.4%	5.0%	30.9%	31.8%	22.5%	9.4%	100.0%
30–34	0.7%	8.3%	41.5%	27.2%	12.9%	9.4%	100.0%
35–39	1.2%	8.2%	40.8%	27.5%	16.8%	5.4%	100.0%
40–44	1.5%	13.6%	42.1%	26.2%	13.6%	3.1%	100.0%
45–49	1.6%	16.7%	54.9%	18.5%	6.5%	1.8%	100.0%
50+	4.3%	31.7%	47.5%	11.7%	2.4%	2.5%	100.0%
Total	1.5%	18.3%	36.8%	24.6%	13.3%	5.5%	100.0%
VNDHS:							
5–9	16.4%	83.5%	0.1%	0.0%	0.0%	0.0%	100.0%
10–14	1.6%	29.2%	21.8%	47.4%	0.0%	0.0%	100.0%
15–19	2.9%	8.3%	6.3%	71.2%	11.3%	0.0%	100.0%
20–24	5.2%	14.2%	10.8%	41.4%	23.4%	5.1%	100.0%
25–29	5.7%	13.9%	8.6%	51.3%	12.8%	7.8%	100.0%
30–34	5.5%	13.7%	8.2%	50.5%	17.7%	4.4%	100.0%
35–39	4.2%	14.8%	7.7%	52.9%	16.8%	3.6%	100.0%
40–44	5.1%	15.0%	9.2%	50.8%	14.7%	5.2%	100.0%
45–49	6.9%	17.7%	8.1%	48.4%	12.7%	6.2%	100.0%
50+	20.8%	30.9%	11.9%	24.3%	8.0%	4.1%	100.0%
Total	8.3%	26.1%	9.8%	42.1%	10.5%	3.2%	100.0%

wsp
water and
sanitation program

SANITATION
FOR ALL