

**Global Scaling Up Handwashing**

**Analysis of Handwashing  
Behaviors Measured in  
Baseline Impact Evaluation  
Surveys: Findings from Peru,  
Senegal, and Vietnam**

**Pavani K. Ram, Bertha Briceño, and Claire Chase, with Ben Arnold,  
John M. Colford, Paul Gertler, and Alexandra Orsola-Vidal**

August 2014

**By Pavani K. Ram, Bertha Briceño, and Claire Chase, with Ben Arnold, John M. Colford, Paul Gertler, and Alexandra Orsola-Vidal**

The authors acknowledge with gratitude the diligence and dedication of the country teams, particularly the principal investigators, along with the data collection teams. Thanks also to Adam Biran, Orlando Hernandez, and Stephen Luby, who provided thoughtful input into the development of handwashing measures included in the impact evaluation baseline surveys.

Global Scaling Up Handwashing is a project by the Water and Sanitation Program (WSP) 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 was 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](http://www.wsp.org/scalinguphandwashing).

WSP is a multidonor 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, Denmark, Finland, France, the Bill & Melinda Gates Foundation, 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.

The findings, interpretations, and conclusions expressed herein are entirely those of the author and should not be attributed to the World Bank or its affiliated organizations, or to members of the Board of Executive Directors of the World Bank or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work.

The material in this publication is copyrighted. Requests for permission to reproduce portions of it should be sent to [worldbankwater@worldbank.org](mailto:worldbankwater@worldbank.org). WSP encourages the dissemination of its work and will normally grant permission promptly. For more information, please visit [www.wsp.org](http://www.wsp.org).

© 2014 International Bank for Reconstruction and Development / The World Bank  
1818 H Street NW  
Washington DC 20433  
Telephone: 202-473-1000  
Internet: [www.worldbank.org](http://www.worldbank.org)

**Global Scaling Up Handwashing**

# **Analysis of Handwashing Behaviors Measured in Baseline Impact Evaluation Surveys: Findings from Peru, Senegal, and Vietnam**

**Pavani K. Ram, Bertha Briceño, and Claire Chase, with Ben Arnold,  
John M. Colford, Paul Gertler, and Alexandra Orsola-Vidal**

August 2014

# Executive Summary

---

Handwashing with soap has been shown to reduce diarrhea and respiratory disease, the two leading causes of childhood deaths in low- and middle-income settings. Global Scaling Up Handwashing is a Water and Sanitation Program (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). The project was implemented by local and national governments with technical support from WSP in four countries: Peru, Senegal, Tanzania, and Vietnam.

In the impact evaluation of Global Scaling Up Handwashing, handwashing behavior is measured at the individual and household levels using self-report, rapid observations, and structured observations. The objective of this report is to describe handwashing behavior at baseline in three project countries: Peru, Senegal, and Vietnam. Data from Tanzania was not available at the time of this analysis.

In all three countries, rapid observations and self-reports were collected among all households included in the baseline surveys. Structured observations were carried out in a subset of households included in the baseline survey in Peru and Senegal. Self-report and structured observation data were used to describe individual handwashing behavior at critical times. The following critical times for handwashing behavior were of interest in these analyses: after fecal contact, before food preparation, and before eating or feeding a child.

At least one type of soap for handwashing was observed in almost all households in Vietnam (97 percent), and in 82 percent of Peru households and 59 percent of Senegal households. There was no handwashing place in 8 to 45 percent of households, one handwashing place in 32 to 61 percent of households, and two handwashing places in 23 to 31 percent of households. Soap and water together were present at one handwashing place in 53 percent of Vietnam households, 46 percent of Peru households, and 21 percent of Senegal households. Both soap and water

together were present in two handwashing places in 15 percent of Peru households, 13 percent of Senegal households, and 27 percent of Vietnam households.

Handwashing with soap after defecation was reported nearly universally in Peru and Vietnam, and by 84 percent of households in Senegal. Soap and water were observed together at the handwashing place used after defecation in 55 percent of Peru households, 29 percent of Senegal households, and 80 percent of Vietnam households. Handwashing with soap before food preparation was reported in the majority of households in each country. Soap and water were observed together at the handwashing place used before food preparation in 57 percent of Peru households, 21 percent of Senegal households, and 79 percent of Vietnam households.

Nearly two-thirds of caregivers in Peru (62 percent) and Vietnam (63 percent) indicated washing hands with soap after fecal contact (after cleaning a child or defecating) during the day preceding the interview, compared to 30 percent of Senegal caregivers. Reports of washing hands with soap before food preparation during the previous day was more common among Peru caregivers (70 percent) than among caregivers in Vietnam (31 percent) and Senegal (12 percent).

Enumerators in Peru more frequently rated caregivers as having visible dirt than did enumerators in Senegal and Vietnam. Hand cleanliness was categorized on a three-point scale based on the observations of nails, palms, and fingerpads. If all three aspects of the hand were recorded as “clean,” overall hand cleanliness was rated as “clean.” Hands were rated as “clean” in 42 percent of Peru caregivers, 71 percent of Senegal caregivers, and 63 percent of Vietnam caregivers. Hands were rated as “very unclean” in 24 percent of Peru caregivers, 7 percent of Senegal caregivers, and 4 percent of Vietnam caregivers.

In five-hour structured observations, soap use for handwashing was observed at least once among all household

members in 73 percent of Peru households and 39 percent of Senegal households. Soap use was noted among primary caregivers in 56 percent of Peru households and 27 percent of Senegal households. In both countries, household members in fewer than half of the households with a fecal contact event were observed to use soap for handwashing at least once after that event. Among all household members, soap use was observed at least once after a fecal contact event in 42 percent of Peru households and 25 percent of Senegal households. Among primary caregivers, soap use was observed at least once after a fecal contact event in 40 percent of Peru households and 30 percent of Senegal households. Among all household members, soap use was observed at least once before food preparation in 23 percent of Peru households and 6 percent of Senegal households, with similar findings among primary caregivers.

The baseline surveys for Global Scaling Up Handwashing in Peru, Senegal, and Vietnam indicate a substantial need

to improve handwashing behavior in all three Scaling Up countries, especially in Senegal. Although soap is available in most homes, it is often not located in places designated for washing hands after defecation and before food preparation. Handwashing with soap at these critical times is practiced by a minority in Peru and Senegal, underscoring the need to improve compliance with handwashing with soap at times relevant to pathogen transmission. Those who maintained a handwashing place often kept soap and water at that place, suggesting the importance of designating a location for handwashing as part of making handwashing a habit. Forthcoming work in these countries will examine the impact of at-scale handwashing interventions on handwashing behavior, as measured by self-report, rapid observations, and structured observations.

# Contents

I. Introduction .....	1
II. Methods .....	3
2.1 Data Analysis .....	3
III. Results .....	7
3.1 Handwashing Behavior Measured at the Household Level .....	7
3.2 Handwashing Behavior Measured at the Individual Level .....	10
3.3 Handwashing Behavior Measured by Structured Observations.....	12
IV. Discussion .....	13
References.....	16
Tables.....	18

## Figures

1: Inclusion and Exclusion of Households in Analysis of Data Regarding Fixed Handwashing Places .....	4
2: Flowcharts to Describe Inclusion and Exclusion of Households for Measurement of Handwashing Places Used after Defecation and before Food Preparation (Peru, Senegal, and Vietnam).....	9

## Tables

1: Indicators of Handwashing Behavior, by Level and Method of Data Collection, Peru, Senegal, and Vietnam, 2009 .....	18
2: Presence of Soap and Water Anywhere in the Home and at Handwashing Places, Peru, Senegal, and Vietnam, 2009 .....	19
3: Description of Place for Washing Hands after Defecation, Peru, Senegal, and Vietnam, 2009 .....	20
4: Observations of Soap and Water at Handwashing Places Used after Defecation, Peru, Senegal, and Vietnam, 2009 .....	20
5a: Description of Place for Washing Hands before Food Preparation, Peru and Senegal, 2009 .....	21
5b: Description of Place for Washing Hands before Food Preparation, Vietnam, 2009 .....	21

- 6: Observations of Handwashing Places for Use before Food Preparation, Peru, Senegal, and Vietnam..... 22
- 7: Self-Reported Handwashing Behavior and Observations of Hand Cleanliness among Individual Caregivers, Peru, Senegal, and Vietnam ..... 23
- 8: Observations of Soap Use for Handwashing during Structured Observations, Peru and Senegal, 2009 ..... 24



---

# I. Introduction

---

Handwashing with soap has been shown to reduce diarrhea and respiratory disease, the two leading causes of childhood deaths in low- and middle-income settings. Most studies contributing to the literature on handwashing and health impact in low-income settings have been small efficacy studies, and only a few have been rigorously conducted randomized controlled trials. Moreover, many studies have either examined health impact or behavior change, but few have examined the extent to which a given intervention results in handwashing behavior change as well as health impact. The latter limits researchers' understanding of how much handwashing behavior needs to be changed in order to realize health impacts.

Global Scaling Up Handwashing was initiated in 2006 by the Water and Sanitation Program (WSP) in Peru, Senegal, Tanzania, and Vietnam. WSP is leading an intensive evaluation to understand the impacts of at-scale handwashing promotion on health, growth, household productivity, and handwashing behavior.

The handwashing promotion interventions deployed in the Global Scaling Up countries were developed using a framework known as FOAM (Focus, Opportunity, Ability, and Motivation) (Coombes and Devine 2010). *Focus* consists of the target behavior (handwashing with soap at critical times) amongst the target population (primary caregivers of young children). *Opportunity* reflects the access to and availability of the necessary products, product attributes, and the social norms that reinforce use of the products. *Ability* is based on individuals' knowledge and the social support for carrying out the target behavior. Finally, *motivation* is built around a set of psychosocial determinants, including belief and attitudes, outcome expectations, threat, and intention to carry out the behavior.

A handwashing promotion intervention can only result in improved health or other downstream benefits if it results in increased handwashing behavior. Thus, information on handwashing behavior change as a result of a handwashing promotion intervention can provide evidence for intermediate pathways between handwashing and health, or

help identify gaps in the uptake in the intervention being implemented.

Handwashing can be measured using a variety of methods, with each approach having advantages and limitations (Ram 2013). Self-report is most widely used and is highly efficient since the necessary questions can be easily integrated into survey instruments. However several studies have demonstrated that, when queried directly, individuals tend to overestimate their true behavior (Biran et al. 2008; Manun'Ebo et al. 1997; Stanton et al. 1987). Self-report may inform about the overall awareness of a population regarding handwashing at critical times of interest. Of note, a number of recent studies, most of which are yet to be published, have demonstrated that self-reported handwashing is associated with a decreased risk of adverse health outcomes (Rhee et al. 2008). Observations, such as whether soap is present in the home or whether soap or water are present at handwashing places, have been shown to be associated with health outcomes and are easily integrated into surveys. Such observations represent proxies or intermediates in the handwashing behavior process; they indicate awareness of the need for soap, intention to wash hands at critical times such as after toileting, or the presence of a visual cue such as a handwashing location adjacent to a toilet. Some of these rapidly observed measures have also been shown to be associated with health outcomes such as all-cause diarrhea or epidemic cholera (DuBois et al. 2006; Luby and Halder 2008).

An objective approach used primarily in research studies has been the quantification of microbes on hands (Luby et al. 2007; Luby et al. 2001). But, hand microbiology remains expensive, so difficult to use in large-scale studies. Moreover, this work has demonstrated that hand contamination is highly variable; thus, a single effort to quantify microbes on hands risks misclassification of the individual with respect to handwashing behavior (Ram et al. 2011). Structured observations consist of recording handwashing behaviors at critical times when hands should likely be washed, such as after fecal contact or before food preparation (Biran et al. 2008). Since a human observer is present in the household, rich contextual details are available

with respect to handwashing behavior. However, persons under observation may alter their usual behavior as a result of being observed (Cousens et al. 1996; Ram et al. 2010). Still, the depth of detail and the objective nature of the data collection make structured observation a useful method for measuring handwashing behavior change.

In the impact evaluation of Global Scaling Up Handwashing, handwashing is measured using self-reports, rapid observations, and structured observations, recognizing that each method provides useful insights into awareness about

handwashing, the availability of materials necessary for handwashing, and the practice of washing hands at critical times. Specifically, with respect to the FOAM framework, this report addresses constructs within the Focus, Opportunity, and Ability domains. The goal of this report is to describe handwashing behavior of households included in the project impact evaluation, as measured during the baseline surveys conducted in Peru, Senegal, and Vietnam. Forthcoming work will examine the impact of the intervention on handwashing behavior within each of these countries as measured by follow-up surveys.

---

# II. Methods

---

In each country, representative samples of households with children under 2 years old were identified in preselected geographic clusters for inclusion in the impact evaluation. The baseline survey of the impact evaluation was conducted in Peru (2008), Senegal (2009), and Vietnam (2009) (Chase and Do 2010; Galiani and Orsola-Vidal 2010; Orsola-Vidal and Yusuf 2011). Information regarding the data collection methods for the baseline surveys can be found in the country-specific reports published by WSP (*ibid.*). Here, the focus is on the methods relevant to the measurement of handwashing behavior and analysis of the baseline survey data. Country-specific analyses are reported here, without aggregation of data beyond the country level. These data were analyzed for the entire set of households and individuals measured at baseline, irrespective of treatment arm. Equivalence of the treatment arms has been established in the country-specific reports.

Handwashing was measured at the household and individual levels using the methods of data collection described above: rapid observations, self-reports, and structured observations (Ram 2013). Key indicators of handwashing behavior are described by the level and method of data collection in Table 1. In all three countries, both rapid observations and self-reports were obtained among all households included in the overall baseline surveys.

Structured observations were carried out in a subset of households included in the baseline survey in Peru and Senegal. Structured observations were not carried out in the Vietnam baseline survey. Observations for individual-level data collection were carried out among primary caregivers of children. In Peru, observations began between 6:30 and 9:30 a.m., and lasted 4 to 5 hours. Self-report and structured observation data are used to describe individual handwashing behavior at critical times. The following critical times for handwashing behavior were of interest in these analyses: after fecal contact, before food preparation, before eating and before feeding a child.

## 2.1 Data Analysis

This section describes the various measures of handwashing collected using rapid observations, self-reports, and structured observations.

### Presence of soap anywhere in the home

The indicator is defined as the presence of at least one type of soap observed by the enumerator anywhere in the home.

Following observations of handwashing places, enumerators asked the household respondent to show soap typically used for washing hands, irrespective of where it was located in the home. All households that allowed observation of soap anywhere in the home are included in this analysis.

Handwashing was measured at the household and individual levels using several methods of data collection: rapid observations, self-report, and structured observations.

**Number of fixed handwashing places in the home**

Fixed locations identified by respondents as places used for handwashing after defecation and before food preparation were examined. The number of handwashing places was tallied to determine whether there were one or two distinct locations. Since respondents were not asked about handwashing places other than those used after defecation and before food preparation, the maximum number of handwashing places that could have been recorded in the baseline surveys was two.

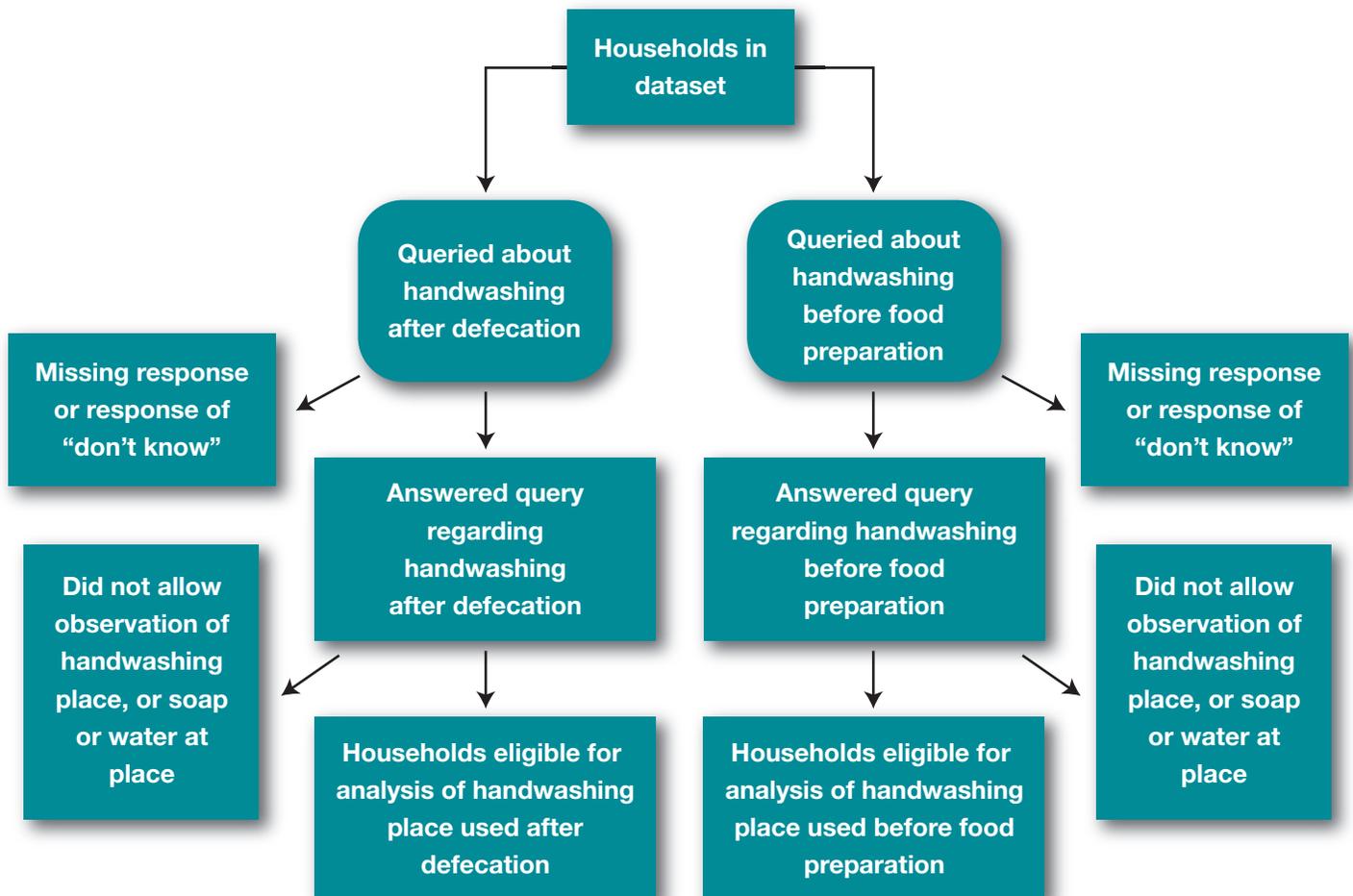
**Presence of soap and water at a fixed handwashing place used post-defecation**

The indicator is defined as the presence of at least one type of soap observed by the enumerator at the fixed handwashing place reportedly used after defecation.

Questions to describe the location of the handwashing place and materials observed at that place followed an introductory question regarding whether hands are usually washed after defecation. Inclusion and exclusion criteria for this analysis are presented in Figure 1. Households in which the respondents indicated washing hands after defecation, and where respondents allowed observation of the handwashing place and the presence of soap and water at that place, were eligible for analysis (Figure 1).

Enumerators recorded whether the handwashing place was inside the toilet or cooking place, or elsewhere in the yard. In Peru and Senegal, if the handwashing place was located elsewhere in the yard, the distance from the toilet was recorded (less than 3 feet from the toilet, 3 to 10 feet from the toilet, or more than 10 feet from the toilet). In

**FIGURE 1: INCLUSION AND EXCLUSION OF HOUSEHOLDS IN ANALYSIS OF DATA REGARDING FIXED HANDWASHING PLACES**



Vietnam, if the handwashing place was located elsewhere in the yard, enumerators recorded the distance in meters, but the pre-coded categories approximated to the ones used in Peru and Senegal.

Enumerators recorded the type of soap present at the handwashing place. In Peru and Senegal, the types of soap observed were beauty bar soap, multipurpose bar soap, and powder/detergent soap. In Vietnam, the types of soap observed were liquid soap, multipurpose bar soap, and powder/detergent soap. For the indicator, a household was considered as having soap at the handwashing place if at least one type of soap, irrespective of type, was present at the handwashing place. The presence of water was recorded at the handwashing place, irrespective of the type of device located therein.

#### **Presence of soap and water at a fixed handwashing place used before food preparation**

The indicator is defined as the presence of at least one type of soap observed by the enumerator at the fixed handwashing place reportedly used before food preparation.

Questions to describe the location of the handwashing place and materials observed at that place followed an introductory question regarding whether hands are usually washed before food preparation. Observations of soap and water were carried out if the handwashing place used before food preparation differed from the handwashing place used after defecation.

To identify households eligible for this analysis, the study started with those who showed a handwashing place used before food preparation that was distinct from the handwashing place used after defecation, and for which observation of the location, soap, and water were all completed (Figure 1). Households in which the handwashing place used after defecation was located in the kitchen and was the same place used to wash hands before food preparation were also included. Households in which the respondent indicated not usually washing hands before food preparation, or that had no specific place for washing hands before food preparation, were then added.

Questions to describe the location of the handwashing place and materials observed at that place followed an

introductory question regarding whether hands are usually washed before food preparation. All households in which the respondents indicated washing hands before food preparation were eligible for analysis, and where respondents allowed observation of the location of the handwashing place and the presence of soap and water at that place (Figure 1). In the baseline survey, if households used the same location for washing hands after defecation and before food preparation, observations of soap and water at that location were not recorded for the food preparation handwashing place; for the analysis below, the values recorded for the post-defecation handwashing place were used to impute data for the pre-food preparation handwashing place.

Enumerators recorded whether the handwashing place was inside the toilet or cooking place, or elsewhere in the yard. Distance of the handwashing place from the cooking place was recorded as described above for the post-defecation handwashing place. Soap and water observations were also recorded similarly.

#### **Cleanliness index of caregiver hands (index based on observation of nails, palms, and fingerpads)**

This is a three-point index based on the enumerator's observation of the cleanliness of the nails, palms, and fingerpads of individual caregivers.

If all three aspects of the hand were observed to be "clean," the caregiver was categorized as having "clean" hands. If at least one aspect of the hand was observed to have visible dirt, the caregiver was categorized as having "very unclean" hands. All other caregivers who allowed observations of the hands were categorized as having "somewhat unclean hands." Caregivers who did not allow observation of one or more aspects of the hand were not included in the analysis of the cleanliness index.

#### **Self-reported handwashing with soap at critical times during the previous day**

The indicator is defined as self-reported handwashing with soap at one of the three critical times during the previous day.

Individual caregivers were asked whether they had washed hands with soap at least once during the previous day (since the same time the day before the enumerator's visit). If they

reported washing hands, they were asked in an unprompted fashion about the context in which hands were washed with soap and all other times that hands were washed with soap during the previous day. Although information about a number of times for handwashing was captured, those of principal interest were after fecal contact, before food preparation or serving food, before eating, and before feeding a child.

In Senegal and Peru, caregivers described as being alone at the time of the interview were included in the analysis, since the presence of others may have influenced caregivers' responses to handwashing questions. This information was not captured in the Vietnam survey but enumerators were trained to ensure respondents' privacy.

### **Observed handwashing with soap at critical times**

Structured observation data can be analyzed and reported in numerous ways. Here, handwashing behavior is analyzed at the household level, rather than based on the role of observed individuals within the household (e.g., primary caregiver versus other adult versus child). The next section reports whether specific critical events were observed during structured observation and whether hands were washed with soap at least once for each type of critical event. The events of interest were the same as those for self-reported handwashing behavior: after fecal contact, before food preparation or serving food, and before eating or feeding a child. Behavior as measured among all household members, and among primary caregivers in particular, is reported.

---

# III. Results

---

## 3.1 Handwashing Behavior Measured at the Household Level

### Presence of soap anywhere in the home

Observation of soap anywhere in the home was possible in 3,658 Peru households, 1,373 Senegal households, and 3,129 Vietnam households (Table 2). At least one type of soap for washing hands was observed in the majority of households in all three countries, but was nearly universal in Vietnam (97 percent). In contrast, 82 percent of Peru households and 59 percent of Senegal households had at least one type of soap for washing hands somewhere in the home. The most common type of soap observed was powder soap in Vietnam (83 percent) and Peru (60 percent), and multipurpose bar soap in Senegal (47 percent).

### Number of handwashing places, and presence of soap and water in those places

The number of handwashing places present in each household was tallied based on the inclusion and exclusion criteria outlined above and in Table 2. Because respondents were asked about handwashing places specifically used after defecation and before food preparation, the maximum number of handwashing places possible was two. In Peru, among 3,448 households, 8 percent had no handwashing place, 61 percent had only one place, and 31 percent had two places. In Senegal, among 1,513 households, 45 percent had no handwashing place, 32 percent had only one place, and 23 percent had two places. In Vietnam, among 3,143 households, 11 percent had no handwashing place, 58 percent had only one place, and 31 percent had two places.

The availability of soap and water at one or more handwashing places in 3,448 households in Peru, 1,513 households in Senegal, and 3,143 households in Vietnam was examined. Soap was present at only one handwashing place in 55 percent of Vietnam households and 51 percent of Peru households, in contrast to 23 percent of Senegal households. Soap was present in two handwashing places in a minority of households in all three countries: Peru (18 percent), Senegal (15 percent), and Vietnam (29 percent). Whereas soap was not present at any handwashing place in 63 percent of Senegal households, this was true of only 17 percent of Vietnam households and 32 percent of Peru households. Water was present at one handwashing place in 58 percent of Peru households, 28 percent of Senegal households, and 57 percent of Vietnam households. Water was present at two handwashing places in 23 percent of Peru households, 15 percent of Senegal households, and 30 percent of Vietnam households. Soap and water together were present at one handwashing place in the majority of Vietnam (53 percent) and Peru (46 percent) households, in contrast to 21 percent of Senegal households. Only a minority of households in each country had soap and water together at two handwashing places. Soap and water together were present in two handwashing places in 15 percent of Peru households, 13 percent of Senegal households, and 27 percent of Vietnam households.

Only a minority of households in each country had soap and water together at two handwashing places.

Notably, among households that had one or two handwashing places, many had soap and water at those locations. In Vietnam, 87 percent of households with only one handwashing place had both soap and water there, and 89 percent of households with two handwashing places had soap and water at both places. In Peru, 64 percent of households with only one handwashing place had both soap and water at that place, and 48 percent of households with two handwashing places had soap and water at both places. Somewhat similar to Peru, 49 percent of Senegal households with only one handwashing place had both soap and water at that place, and 55 percent of households with two handwashing places had soap and water at both places.

Details regarding availability of soap and/or water among households with one or two handwashing places are included in Table 2.

#### **Location of handwashing place and presence of soap and water at handwashing place used after defecation**

The number of households eligible for analysis regarding the handwashing place used after defecation was 3,438 in Peru, 1,471 in Senegal, and 3,124 in Vietnam (Figure 2). In each country, the majority of respondents in households eligible for analysis reported washing hands after defecation (Table 3). The most common location of the handwashing place used after defecation varied. In Peru, the handwashing place was more than 10 feet away from the toilet facility in 34 percent of Peru households and 35 percent of Vietnam households. In contrast, in Senegal, the most common fixed locations for handwashing were inside the toilet facility (22 percent) and within 3 feet of the toilet facility (22 percent). Whereas only 9 percent of households in Vietnam and 13 percent of households in Peru had no specific place for washing hands, 45 percent of households in Senegal had no such place.

Enumerators observed at least one type of soap at the handwashing place used after defecation in 82 percent of Vietnam households, 61 percent of Peru households, and 32 percent of Senegal households (Table 4). The most common type of soap observed was powder soap at the post-defecation handwashing place in Peru (40 percent), and multipurpose bar soap in Vietnam (45 percent) and Senegal (25 percent). Water was present at the handwashing place

in the majority of Vietnam (86 percent) and Peru (74 percent) households, in contrast to only 36 percent of Senegal households. Both soap and water together were observed at the post-defecation handwashing place in 80 percent of Vietnam households, in contrast to 55 percent of households and just 29 percent of Senegal households.

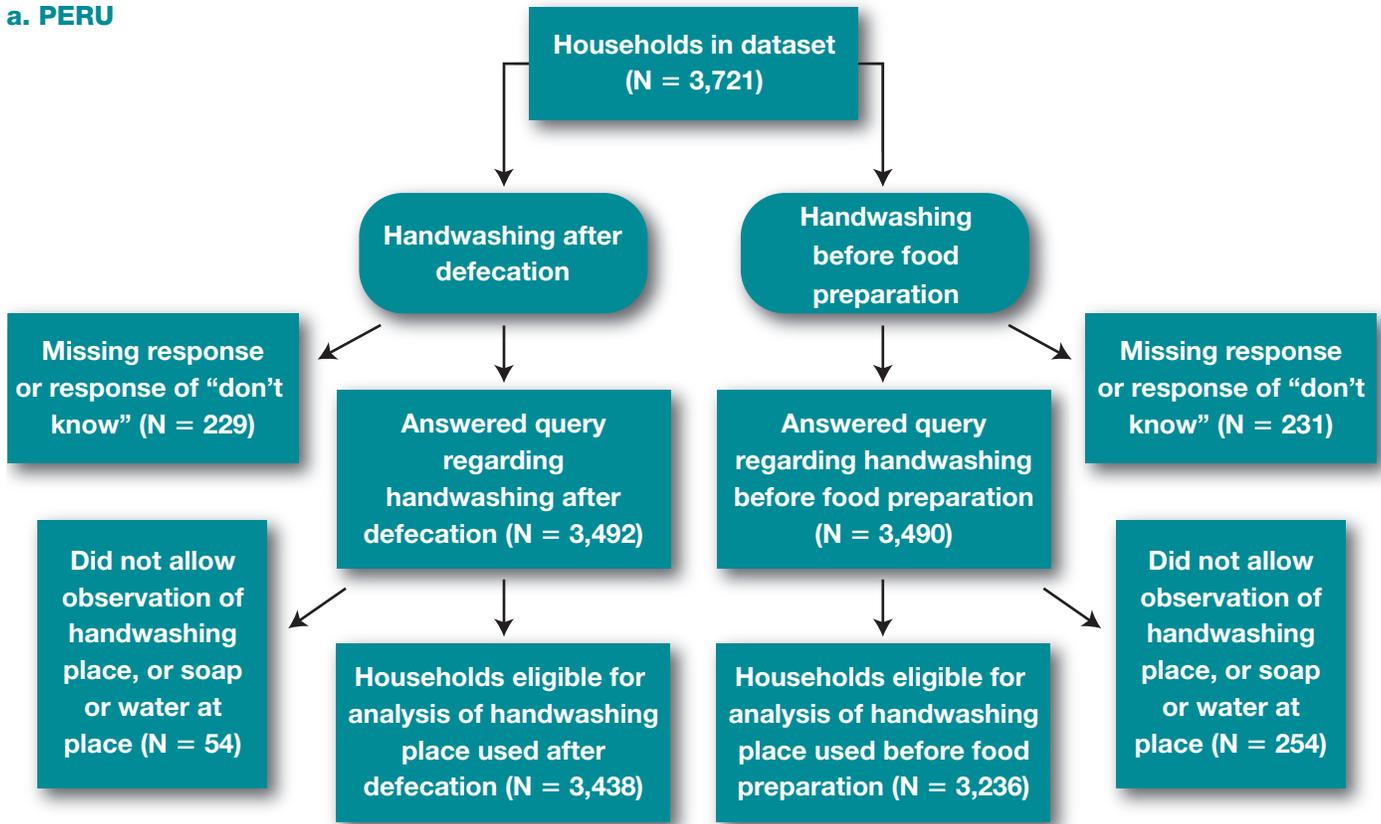
#### **Location of handwashing place and presence of soap and water at handwashing place used before food preparation**

The number of households eligible for analysis regarding the handwashing place used before food preparation was 3,236 in Peru, 1,425 in Senegal, and 3,040 in Vietnam (Figure 2). In each country, the majority of respondents in households eligible for analysis reported washing hands before food preparation (Tables 5a and 5b). The most common location of the handwashing place used before food preparation varied. In Peru, the handwashing place was inside the cooking area in 40 percent of Peru households. In Vietnam, the handwashing place was more than 3 meters from the toilet facility in 37 percent of homes. In contrast, in Senegal, the most common fixed location for handwashing was within 3 feet of the cooking area (18 percent) but, more importantly, 56 percent of eligible households had no specific place for washing hands before food preparation. In contrast to Senegal, 10 percent of Vietnam households and 9 percent of Peru households had no specific place.

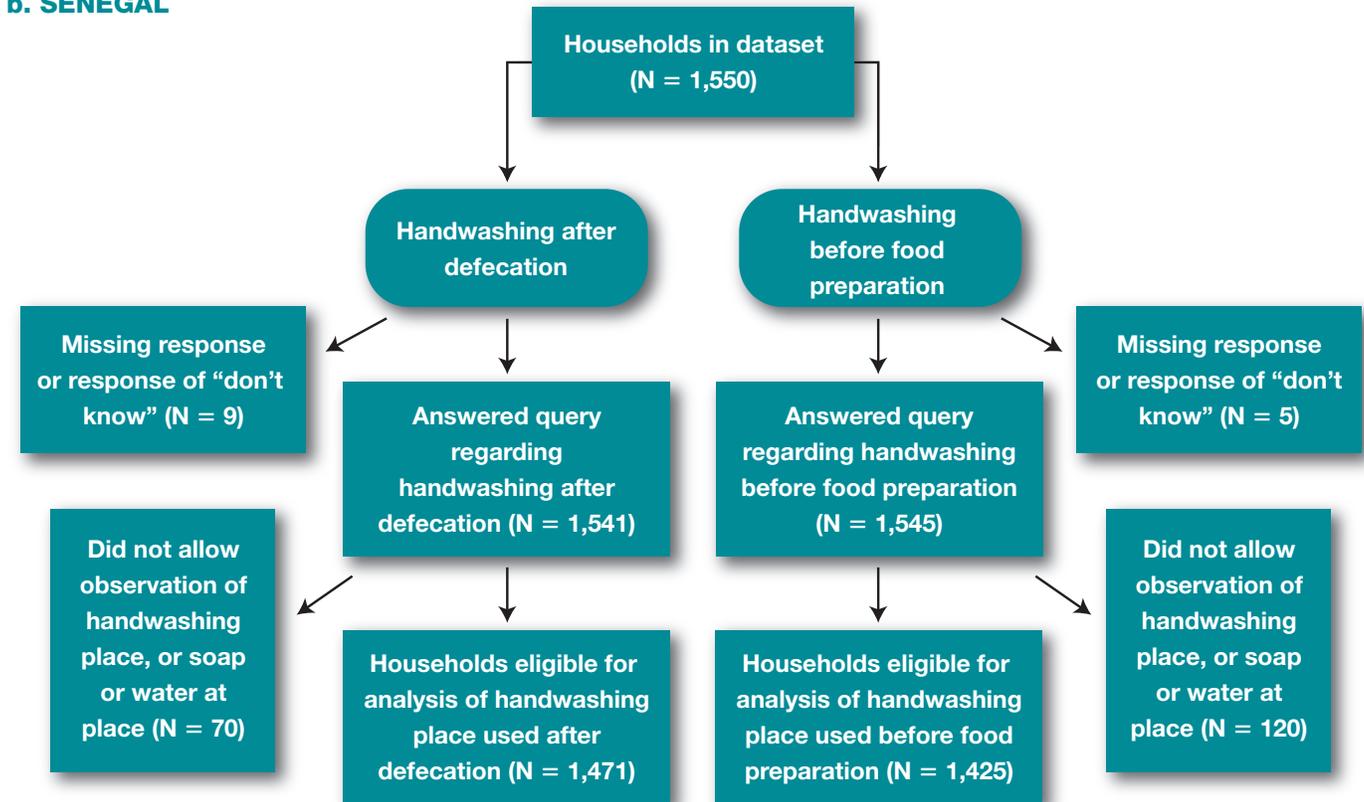
Enumerators observed at least one type of soap at the handwashing place used before food preparation in 80 percent of Vietnam households, 64 percent of Peru households, and just 24 percent of Senegal households (Table 6). The most common type of soap observed was powder soap in households in Peru (47 percent) and Vietnam (60 percent). In Senegal, 16 percent of households had multipurpose bar soap at this handwashing place. Water was present at the food preparation handwashing place in the majority of Vietnam (85 percent) and Peru (76 percent) households, in contrast to only 27 percent of Senegal households. Both soap and water together were observed at the food preparation handwashing place in 79 percent of Vietnam households and 57 percent of Peru households, unlike Senegal, where soap and water were observed together at the food preparation handwashing place in only 21 percent of Senegal households.

**FIGURE 2: FLOWCHARTS TO DESCRIBE INCLUSION AND EXCLUSION OF HOUSEHOLDS FOR MEASUREMENT OF HANDWASHING PLACES USED AFTER DEFECCATION AND BEFORE FOOD PREPARATION (PERU, SENEGAL, AND VIETNAM)**

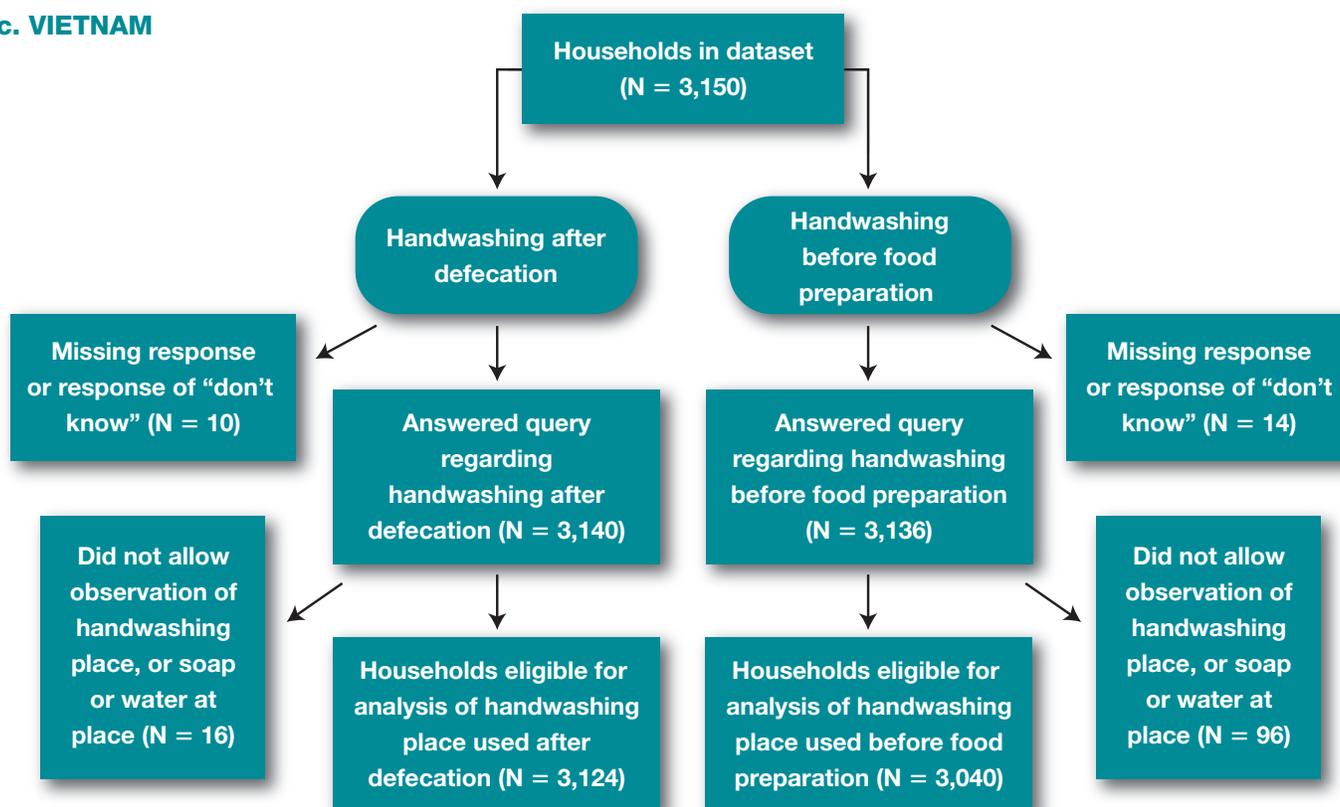
**a. PERU**



**b. SENEGAL**



**c. VIETNAM**



**3.2 Handwashing Behavior Measured at the Individual Level**

Handwashing behavior was measured among individual caregivers of children less than 5 years old in Peru, Senegal, and Vietnam (Table 7). The analysis below reports on all caregivers queried, rather than only one caregiver per household. Analysis in Peru and Senegal was restricted to all caregivers who were interviewed alone since the presence of another person may have impacted their responses; in Vietnam, enumerators were trained to ensure that caregivers were alone when interviews were done. The vast majority of caregivers in all three countries reported washing hands

with soap at least once during the previous day. Whereas nearly two-thirds of caregivers in Peru (62 percent) and Vietnam (63 percent) indicated washing hands with soap after fecal contact (after cleaning a child or defecating) during the day preceding the interview, only 30 percent of Senegal caregivers cited this critical time for having washed hands with soap.

Washing hands with soap before food preparation during the previous day was far more commonly reported by Peru caregivers (70 percent) than by caregivers in Vietnam (31 percent) and Senegal (12 percent). One-third of

caregivers in Peru and Vietnam reported having washed hands with soap before feeding a child during the previous day in contrast to only 5 percent of Senegal caregivers. Similar proportions of caregivers in Senegal (16 percent) and Vietnam (20 percent) reported washing hands with soap before eating; this data was not available for Peru due to an error in the data collection tool. Whereas 91 percent of Peru caregivers and 81 percent of Vietnam caregivers reported washing hands with soap at one or more of these critical times, only 46 percent of Senegal caregivers reported doing so. Few caregivers in each country indicated washing hands with soap at each of these critical times, but it is possible that the critical time did not occur (for example, they may not have had to feed a child themselves).

The proportion of respondents indicating that washing with soap is the best way to clean hands was nearly identical in the three countries: Peru (85 percent), Senegal (88 percent), and Vietnam (86 percent).

Enumerators rated the cleanliness of caregivers' nails, palms, and fingerpads. Ratings among caregivers in Senegal and Vietnam were similar to each other but dissimilar to ratings among Peru caregivers. In Peru, enumerators indicated the presence of visible dirt under nails (26 percent), on palms (19 percent), and on fingerpads (19 percent). Visible dirt was much less commonly recorded in Senegal: nails (10 percent), palms (4 percent), and fingerpads (4 percent). Similar to Senegal, in Vietnam, visible dirt was recorded for 5 percent of nails, 2 percent of palms, and 2 percent of fingerpads. Hand cleanliness was categorized on a three-point scale based on the observations of nails, palms, and fingerpads. If all three aspects of the hand were recorded as "clean," overall hand cleanliness was rated "clean." If at least one aspect of the hands was recorded as having "visible dirt," overall hand cleanliness was rated as "very unclean." All others were rated as "somewhat unclean." Hands were rated as "clean" in 42 percent of Peru caregivers, 71 percent of Senegal caregivers, and 63 percent of Vietnam caregivers. Hands were rated as "very unclean" in 24 percent of Peru caregivers, 7 percent of Senegal caregivers, and 4 percent of Vietnam caregivers. It should be noted that ratings of cleanliness on one aspect of the hand were significantly correlated with ratings of cleanliness on another aspect of the hand. For example, in Senegal, palm cleanliness ratings were highly correlated with fingerpad cleanliness ( $R = 0.92$ ,  $p < 0.0001$ ); palm cleanliness ratings were also significantly correlated with fingernail cleanliness ratings, although the strength of the correlation was somewhat lower ( $R = 0.67$ ,  $p < 0.0001$ ). Similar findings were noted for both Peru and Vietnam (data not shown).

The vast majority of caregivers in all three countries reported washing hands with soap at least once during the previous day.

### 3.3 Handwashing Behavior Measured by Structured Observations

Structured observations were conducted in 159 households in Peru and 110 households in Senegal (Table 8). The median number of events observed among all household members was 11 in Peru (range 4–50) and 9 in Senegal (range 1–31). The median number of events among primary caregivers was 8 in Peru (range 1–22) and 3 in Senegal (range 0–11). Soap use for handwashing was observed at least once among all household members in 73 percent of Peru households, in contrast to 39 percent of Senegal households. Soap use was noted among primary caregivers in 56 percent of Peru households and 27 percent of Senegal households. The median proportion of events accompanied by soap use was 16 percent in Peru (range 0–67 percent) and 0 percent in Senegal (0–75 percent).

Fecal contact events were observed in a majority of Peru households but in fewer than half of Senegal households. In both countries, household members in fewer than half of the households with a fecal contact event were observed to use soap for handwashing at least once, with the proportion using soap somewhat higher in Peru than in Senegal.

Events of preparing or serving food were also observed overall and among primary caregivers in a majority of Peru households and in far lower proportions of Senegal

households. Among those with at least one food preparation event observed, only 23 percent of Peru household members (22 percent of primary caregivers) were observed to wash hands with soap. The proportion of Senegal household members observed to wash hands with soap at least once before a food preparation event was even lower at 6 percent (7 percent of primary caregivers).

Events of feeding young children were observed among all household members in 83 percent of Peru households and 83 percent of Peru primary caregivers. In Senegal, 73 percent of household members and 71 percent of primary caregivers were observed at a feeding event. Soap use was low in both countries, with just 12 percent of Peru household members and 5 percent of Senegal household members observed to wash hands with soap before a feeding event.

Eating events were observed among 89 percent of Peru household members and 72 percent of Senegal household members. Only 43 percent of Peru primary caregivers and 24 percent of Senegal primary caregivers were observed eating. Soap use was far more common among Peru household members overall (46 percent) than among Peru primary caregivers (17 percent). Senegal household members and primary caregivers had similarly low rates of handwashing with soap before eating (9 and 7 percent, respectively).

---

## IV. Discussion

---

The baseline surveys for Global Scaling Up Handwashing in Peru, Senegal, and Vietnam indicate a substantial potential and need to improve handwashing behavior in all three Scaling Up countries. Based on the authors' experience and that of others engaged in measuring handwashing (Ram 2013; Biran et al. 2008; Ram et al. 2010) several measures of handwashing behavior were employed to describe related but distinct constructs. These constructs describing the Focus, Opportunity, and Ability domains of the FOAM framework (Coombes and Devine 2010) include the availability of materials required for handwashing, behavior at critical times for handwashing, and cleanliness of hands. The various measures paint relatively consistent pictures of the state of handwashing within each project country, with the greatest opportunity to improve handwashing behavior in Senegal, but also robust potential to do so in both Peru and Vietnam.

In Senegal, only a minority of households were found to have a fixed handwashing place near toileting and food preparation areas, and soap was available anywhere in the home in only about 60 percent of households. Moreover, small minorities of Senegal households observed were found to have washed hands with soap at least once after fecal contact and before food preparation. Even in Peru, fewer than half of households under structured observation were found to wash hands with soap after fecal contact, and far fewer did so before food preparation. Washing hands with soap, or even with water alone, at these two critical times (after defecation and before food preparation) has been associated with reduced diarrhea risk (Luby et al. 2010). These findings indicate the substantial need to improve handwashing at critical times in both Senegal and Peru.

There may be several explanations for the low frequency of handwashing with soap at critical times in the Scaling Up countries. It was common in Senegal not to have a specific place to wash hands, even after defecation. In both Peru and Vietnam, the handwashing place was more than 10 feet away from the toilet facility in a third of households. The presence of a fixed handwashing place, particularly inside or in close proximity to the toilet facility, may provide a useful visual cue to stimulate handwashing behavior. In particular, such visual cues may be critical to the development of handwashing habits, described by Curtis as "automated behaviors produced by cues, often as part of a routine" (Curtis et al. 2009). In high-income countries, hand hygiene in healthcare settings was believed to be hampered because clinicians were forced to walk away from patient care areas in order to access sinks for handwashing with soap. The placement of waterless hand sanitizer dispensers in large-volume in-patient care areas has led to improvements in hand hygiene behavior by providing the visual cue and by improving access to the necessary materials (Luby and Halder 2008; CDC 2002).

The presence of a fixed handwashing place, particularly inside or in close proximity to the toilet facility, may provide a useful visual cue to stimulate handwashing behavior.

Even if a fixed handwashing location exists, soap and water for washing hands must be present in order to allow the behavior to occur. The presence of water at a fixed handwashing place has been found to be independently associated with reduced respiratory illness risk in a low-income urban setting (Luby and Halder 2008). A number of observational studies demonstrate lower risk of diarrhea among households with soap observed anywhere in the home, compared to households without soap (DuBois et al. 2006; Peterson et al. 1998). An investigation in western Kenya also found that the presence of soap in the home is associated with a lower risk of respiratory illness (Kamm et al. 2011). Unlike Vietnam, where most households were found to have soap and water present at a post-defecation handwashing place, far lower proportions of households in Peru and Senegal were found to have soap and water at that place. Water was more commonly present at either fixed handwashing location than was soap. It is notable that large proportions of households that designated places for washing hands after defecation and before food preparation kept both soap and water at those locations. This suggests that the practice of designating a handwashing location may contribute to building a handwashing habit at these critical times.

As indicated by more frequent self-report of handwashing after defecation than before food preparation, awareness of the importance or at least the social desirability of handwashing appears to be greater for washing hands after fecal contact than before food preparation. Recent work from Bangladesh suggests that handwashing with soap before food preparation is associated with a decreased risk of child diarrhea (Luby et al. 2011), indicating the importance of increasing awareness around handwashing at this critical time.

Self-reported handwashing behavior has been found repeatedly to overestimate observed handwashing behavior (Biran et al. 2008; Manun'Ebo et al. 1997; Stanton et al. 1987). Here too, this phenomenon was found, with 62 percent of Peru caregivers reporting having washed hands at least once following fecal contact during the day preceding intervention; in contrast, during structured observation, only 40 percent of Peru caregivers observed at a fecal contact event washed hands with soap. In Senegal, although the observed and reported frequencies of handwashing after fecal contact were similar, they differed somewhat with respect to food preparation. Even behavior during structured observation is probably subject to reactivity based on the presence of the observer (Ram et al. 2010). Self-report and behavior displayed during observation are likely subject to the respondent's awareness of social norms around handwashing behavior, as observed in high- and low-income settings (Ram et al. 2010; Pedersen et al. 1986; Drankiewicz and Dundes 2003; Munger and Harris 1989). Awareness of a social norm, that a given behavior is expected by society, as represented by the outside observer, may be useful to improve that behavior. For example, the Community-Led Total Sanitation (CLTS) approach exploits social norms for behavior change by changing societal expectations for social behavior based on engendering disgust and shame around open defecation. In particular, perceptions that handwashing is

practiced by those more affluent or more desirable may be important motivators for handwashing behavior (Curtis et al. 2009). The extent to which interventions modulate perceptions of determinants of handwashing behavior, including social norms, shall be evaluated in the endline surveys for the project.

Whereas most of the measures of handwashing appear to be consistent in describing current behaviors, the ratings of hand cleanliness do not. For example, most of the measures of handwashing would seem to indicate that there is greatest room for improvement in handwashing behavior in Senegal. In contrast, a higher proportion of Senegal caregivers were rated as having “very clean” hands, compared to Peru and Vietnam caregivers. Similar instructions were provided in training manuals for this question to the investigators responsible for all three countries. The measure is observed but is subjective, based on the enumerator’s perceptions of skin cleanliness and skin pigment. One prior investigation conducted in Bangladesh demonstrated the association between observed hand cleanliness and presence of water at a

handwashing place (Halder et al. 2010); as indicated above, the latter measure has been associated with reduced risk of respiratory illness. Future analyses of project data will provide an opportunity to learn how well this measure correlates with other measures of handwashing behavior.

In conclusion, the baseline surveys of Global Scaling Up Handwashing indicate opportunities to improve handwashing behavior in all of the countries where interventions are being tested. There is substantial potential to improve handwashing in order to reduce diarrhea and respiratory illness, particularly in Senegal and Peru, and to a lesser extent in Vietnam. Future analyses of handwashing behavior measures are expected to address relationships between the measures and socioeconomic status, a very important confounder of handwashing behavior and childhood illness risk. In addition, in the future, correlations could be described between measures and relationship with disease risk and other hygiene behaviors in the home, including sanitation and household water treatment.

# References

- Biran, A., T. Rabie, W. Schmidt, S. Juvekar, S. Hirve, and V. Curtis. 2008. "Comparing the Performance of Indicators of Hand-Washing Practices in Rural Indian Households." *Trop Med Int Health* 13 (2):278–285.
- CDC. 2002. "Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force." *MMWR* 51: 1–56.
- Chase, C., and Q.-T. Do. 2010. "Findings from the Impact Evaluation Baseline Survey in Vietnam." Working Paper. Washington, DC: Water and Sanitation Program, World Bank.
- Coombes, Y., and J. Devine. 2010. "Introducing FOAM: A Framework to Analyze Handwashing Behaviors to Design Effective Handwashing Programs." Working Paper. Washington, DC: Water and Sanitation Program, World Bank. [http://www.wsp.org/sites/wsp.org/files/publications/WSP\\_IntroducingFOAM\\_HWWS.pdf](http://www.wsp.org/sites/wsp.org/files/publications/WSP_IntroducingFOAM_HWWS.pdf).
- Cousens, S., B. Kanki, S. Toure, I. Diallo, and V. Curtis. 1996. "Reactivity and Repeatability of Hygiene Behaviour: Structured Observations from Burkina Faso." *Soc Sci Med* 43 (9): 1299–1308.
- Curtis, V. A., L. O. Danquah, and R. V. Aunger. 2009. "Planned, Motivated and Habitual Hygiene Behaviour: An Eleven Country Review." *Health Educ Res* 24 (4): 655–673.
- Drankiewicz, D., and L. Dundes. 2003. "Handwashing among Female College Students." *Am J Infect Control* 31 (2): 67–71.
- DuBois, A. E., M. Sinkala, P. Kalluri, M. Makasa-Chikoya, and R. E. Quick. 2006. "Epidemic Cholera in Urban Zambia: Hand Soap and Dried Fish as Protective Factors." *Epidemiol Infect* 134 (6): 1226–1230.
- Galiani, S., and A. Orsola-Vidal. 2010. "Findings from the Impact Evaluation Baseline Survey in Peru. Scaling Up Handwashing Behavior." Washington DC: Water and Sanitation Program, World Bank.
- Halder, A. K., C. Tronchet, S. Akhter, A. Bhuiya, R. Johnston, and S. P. Luby. 2010. "Observed Hand Cleanliness and Other Measures of Handwashing Behavior in Rural Bangladesh." *BMC Public Health* 10: 545.
- Kamm, K. B., D. R. Feikin, G. Bigogo, et al. 2011. "Associations with Handwashing in the Home and Respiratory and Diarrheal Illness in Children under Five Years Old in Rural Western Kenya." Paper presented at American Society of Tropical Medicine and Hygiene. Philadelphia, Pennsylvania.
- Luby, S., A. K. Halder, T. M. Huda, C. Tronchet, L. Unicomb, and R. B. Johnston. 2010. "The Importance of Handwashing before Preparing Food: Observed Handwashing and Subsequent Diarrhea in Rural Bangladesh." Paper presented at American Society of Tropical Medicine and Hygiene 59th Annual Meeting. Atlanta, Georgia.
- Luby, S. P., M. Agboatwalla, W. Billhimer, and R. M. Hoekstra. 2007. "Field Trial of a Low Cost Method to Evaluate Hand Cleanliness." *Trop Med Int Health* 12 (6): 765–771.
- Luby, S. P., M. Agboatwalla, A. Raza, J. Sobel, E. D. Mint, K. Baier, R. M. Hoekstra, M. H. Rahbar, R. Hassan, S. M. Qureshi, and E. J. Gangarosa. 2001. "Microbiologic Effectiveness of Hand Washing with Soap in an Urban Squatter Settlement, Karachi, Pakistan." *Epidemiol Infect* 127 (2): 237–244.
- Luby, S. P., and A. K. Halder. 2008. "Associations among Handwashing Indicators, Wealth, and Symptoms of Childhood Respiratory Illness in Urban Bangladesh." *Trop Med Int Health* 13 (6): 835–844.
- Luby, S. P., A. K. Halder, T. Huda, L. Unicomb, and R. B. Johnston. 2011. "The Effect of Handwashing at Recommended Times with Water Alone and with Soap on Child Diarrhea in Rural Bangladesh: An Observational Study." *PLoS Med* 8 (6): e1001052.
- Manun'Ebo, M., S. Cousens, P. Haggerty, M. Kalengaie, A. Ashworth, and B. Kirkwood. 1997. "Measuring Hygiene Practices: A Comparison of Questionnaires with Direct Observations in Rural Zaire." *Trop Med Int Health* 2 (11): 1015–1021.
- Munger, K., and S. J. Harris. 1989. "Effects of an Observer on Handwashing in a Public Restroom." *Perceptual and Motor Skills* 69: 733–734.

- Orsola-Vidal, A., and A. Yusuf. 2011. "Findings from the Impact Evaluation Baseline Survey in Senegal. Scaling Up Handwashing Behavior." Technical Paper. Washington, DC: Water and Sanitation Program, World Bank.
- Pedersen, D. M., S. Keithly, and K. Brady. 1986. "Effects of an Observer on Conformity to Handwashing Norm." *Perceptual and Motor Skills* 62 (1): 169–170.
- Peterson, E., L. Roberts, M. Toole, and D. Peterson. 1998. "The Effect of Soap Distribution on Diarrhoea: Nyamithuthu Refugee Camp," *Int J Epi* 27 (3): 520–524.
- Ram, P. 2013. "Practical Guidance for Measuring Handwashing Behavior: 2013 Update." Working Paper. Washington, DC: Water and Sanitation Program, World Bank. <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Practical-Guidance-Measuring-Handwashing-Behavior-2013-Update.pdf>.
- Ram, P., S. Luby, A. Halder, M. Islam, and S. Granger. 2010. "Improving Measures of Handwashing Behavior." Working Paper. Washington, DC: Water and Sanitation Program, World Bank.
- Ram, P. K., A. K. Halder, S. P. Granger, et al. 2010. "Is Structured Observation a Valid Technique to Measure Handwashing Behavior? Use of Acceleration Sensors Embedded in Soap to Assess Reactivity to Structured Observation." *Am J Trop Med Hyg* 83 (5): 1070–1076.
- Ram, P. K., I. Jahid, A. K. Halder, B. Nygren, M. S. Islam, S. P. Granger, J. W. Molyneaux, and S. P. Luby. 2011. "Variability in Hand Contamination Based on Serial Measurements: Implications for Assessment of Hand-Cleansing Behavior and Disease Risk." *Am J Trop Med Hyg* 84 (4): 510–516.
- Rhee, V., L. C. Mullany, S. K. Khatri, J. Katz, S. C. LeClerq, G. L. Darmstadt, and J. M. Tielsch. 2008. "Maternal and Birth Attendant Hand Washing and Neonatal Mortality in Southern Nepal." *Arch Pediatr Adolesc Med* 162 (7): 603–608.
- Stanton, B. F., J. D. Clemens, K. M. Aziz, and M. Rahman. 1987. "Twenty-Four-Hour Recall, Knowledge-Attitude-Practice Questionnaires, and Direct Observations of Sanitary Practices: A Comparative Study." *Bull World Health Organ* 65 (2): 217–222.

# Tables

**TABLE 1: INDICATORS OF HANDWASHING BEHAVIOR, BY LEVEL AND METHOD OF DATA COLLECTION, PERU, SENEGAL, AND VIETNAM, 2009**

Indicator	Method of Data Collection	Level of Data Collection	Countries in Which Indicator Was Assessed at Baseline
Presence of soap anywhere in the home	Rapid observation	Household	All
Presence of soap and water at the handwashing place used post-defecation	Rapid observation	Household	All
Presence of soap and water at the handwashing place used before food preparation	Rapid observation	Household	All
Cleanliness index of caregiver hands (index based on observation of nails, palms, and fingerpads)	Rapid observation	Individual—caregiver	All
Handwashing with soap after fecal contact during previous day	Self-report	Individual—caregiver	All
Handwashing with soap before food preparation during previous day	Self-report	Individual—caregiver	All
Handwashing with soap before feeding a child during previous day	Self-report	Individual—caregiver	All
Handwashing with soap before eating during previous day	Self-report	Individual—caregiver	Senegal and Vietnam (error in Peru's data collection tool)
Handwashing with soap after fecal contact	Structured observation	Individual—all household members and primary caregivers	Peru and Senegal (subsets)
Handwashing with soap before food preparation	Structured observation	Individual—all household members and primary caregivers	Peru and Senegal (subsets)
Handwashing with soap before feeding a child	Structured observation	Individual—all household members and primary caregivers	Peru and Senegal (subsets)
Handwashing with soap before eating	Structured observation	Individual—all household members and primary caregivers	Peru and Senegal (subsets)

**TABLE 2: PRESENCE OF SOAP AND WATER ANYWHERE IN THE HOME AND AT HANDWASHING PLACES, PERU, SENEGAL, AND VIETNAM, 2009**

	Peru		Senegal		Vietnam	
<b>Observation of soap presence anywhere in the home</b>						
Number of households in which respondent was asked to show soap located anywhere in home	3,721		1,372		3,129	
Observation allowed	3,658		1,373		3,129	
At least one type of soap for washing hands observed anywhere in the home	3,004	82%	813	59%	3,031	97%
Type(s) of soap observed in the home*						
Beauty bar soap	1,101	30%	17	1%	—	—
Multipurpose bar soap	697	19%	650	47%	1,774	57%
Liquid soap	—	—	—	—	725	23%
Powder/detergent soap	2,191	60%	241	18%	2,596	83%
<b>Number of handwashing places** and presence of soap and/or water at those handwashing places</b>						
Number of households in which respondent answered question about whether hands are ever washed after defecation or before preparing food	3,492		1,549		3,143	
Number of households that allowed observation of a handwashing place or who did not have a designated handwashing place	3,448		1,513		3,143	
Households without any handwashing place	281	8%	678	45%	337	11%
Only one handwashing place	2,087	61%	491	32%	1,836	58%
Handwashing place has soap	1,499	44%	282	19%	1,659	53%
Handwashing place has water	1,807	52%	347	23%	1,772	56%
Handwashing place has both soap and water	1,346	39%	240	16%	1,597	51%
Two handwashing places	1,080	31%	344	23%	970	31%
One handwashing place has soap	243	7%	61	4%	54	2%
One handwashing place has water	181	5%	74	5%	34	1%
One handwashing place has both soap and water	255	7%	71	5%	83	3%
Two handwashing places have soap	605	18%	220	15%	928	30%
Two handwashing places have water	804	23%	232	15%	902	29%
Two handwashing places have soap and water	523	15%	190	13%	864	28%

\*Multiple types of soap were observed in some households.

\*\* Handwashing places reportedly used after defecation and before food preparation but did not inquire about any other handwashing places in the home. Thus, the maximum number of handwashing places recorded in the baseline surveys was two.

**TABLE 3: DESCRIPTION OF PLACE FOR WASHING HANDS AFTER DEFECACTION, PERU, SENEGAL, AND VIETNAM, 2009**

	Peru		Senegal		Vietnam	
Number of households in dataset	3,721		1,550		3,150	
Number of households in which respondent answered yes or no to question about whether hands are ever washed after defecation	3,492		1,541		3,140	
Households that allowed observation of handwashing place, and soap and water at that place, or that denied washing hands after defecation	3,438		1,471		3,124	
Report washing hands after defecation	3,399	99%	1,230	84%	3,065	98%
<b>Location of handwashing place</b>						
Inside toilet facility	334	10%	270	22%	718	23%
Inside kitchen/cooking place	337	10%	17	1%	133	4%
Within 3 ft. of toilet facility	626	18%	276	22%	514	17%
>3 ft. but ≤10 ft. from toilet facility	477	14%	88	7%	344	11%
>10 ft. from toilet facility	1,169	34%	29	2%	1,065	35%
No specific place	455	13%	547	45%	291	9%

**TABLE 4: OBSERVATIONS OF SOAP AND WATER AT HANDWASHING PLACES USED AFTER DEFECACTION, PERU, SENEGAL, AND VIETNAM, 2009**

	Peru		Senegal		Vietnam	
Number of households in dataset	3,721		1,550		3,150	
Number of households in which respondent answered yes or no to question about whether hands are ever washed after defecation	3,492		1,541		3,140	
Households that allowed observation of handwashing place, and soap and water at that place, or that denied washing hands after defecation	3,438		1,471		3,124	
Households with soap present at the handwashing place	2,089	61%	468	32%	2,577	82%
Beauty bar soap	697	20%	13	1%	—	—
Multipurpose bar soap	432	13%	372	25%	1,416	45%
Liquid soap	—	—	—	—	543	17%
Powder/detergent soap	1,365	40%	87	6%	1,906	61%
Households with water present at the handwashing place	2,557	74%	532	36%	2,680	86%
Households with soap and water together at the handwashing place	1,892	55%	423	29%	2,488	80%

**TABLE 5A: DESCRIPTION OF PLACE FOR WASHING HANDS BEFORE FOOD PREPARATION, PERU AND SENEGAL, 2009**

	Peru		Senegal	
Number of households in dataset	3,721		1,550	
Number of households in which respondent answered yes or no to question about whether hands are ever washed before food preparation	3,490		1,545	
Households that allowed observation of handwashing place, and soap and water at that place, or that denied washing hands before food preparation	3,236		1,425	
Report washing hands before food preparation	3,213	99%	1,242	87%
<b>Location of handwashing place</b>				
Inside toilet facility	58	2%	11	1%
Inside cooking area	1,295	40%	80	6%
Within 3 ft. of cooking area	578	18%	225	18%
>3 ft. but ≤10 ft. from cooking area	558	17%	160	13%
>10 ft. from cooking area	443	14%	70	6%
No specific place	281	9%	693	56%

**TABLE 5B: DESCRIPTION OF PLACE FOR WASHING HANDS BEFORE FOOD PREPARATION, VIETNAM, 2009**

Number of households in dataset	3,150
Number of households in which respondent answered yes or no to question about whether hands are ever washed before food preparation	3,136
Households that allowed observation of handwashing place, and soap and water at that place, or that denied washing hands before food preparation	3,040
Report washing hands before food preparation	2,936 97%
<b>Location of handwashing place</b>	
Inside toilet facility	99 3%
Inside kitchen/cooking area	463 16%
Elsewhere in yard <1 m of toilet facility	553 19%
Elsewhere in yard <3 m and <1 m of toilet facility	470 16%
Elsewhere in yard >3 m from toilet facility	1,049 37%
No specific place	299 10%

**TABLE 6: OBSERVATIONS OF HANDWASHING PLACES FOR USE BEFORE FOOD PREPARATION, PERU, SENEGAL, AND VIETNAM, 2009**

	Peru (N = 3,236)		Senegal (N = 1,425)		Vietnam (N = 3,040)	
Number of households in dataset	3,721		1,550		3,150	
Number of households in which respondent answered yes or no to question about whether hands are ever washed before food preparation	3,490		1,545		3,136	
Households that allowed observation of handwashing place, and soap and water at that place, or that denied washing hands before food preparation	3,236		1,425		3,040	
Households identified with soap present at the handwashing place	2,074	64%	338	24%	2,437	80%
Beauty bar soap	541	17%	3	<1%	—	—
Multipurpose bar soap	365	11%	232	16%	1,229	40%
Liquid soap	—	—	—	—	491	16%
Powder/detergent soap	1,529	47%	150	11%	1,830	60%
Households identified with water present at the handwashing place	2,461		391		2,595	
Households identified with soap and water present at the handwashing place	1,852		293		2,396	

**TABLE 7: SELF-REPORTED HANDWASHING BEHAVIOR AND OBSERVATIONS OF HAND CLEANLINESS AMONG INDIVIDUAL CAREGIVERS, PERU, SENEGAL, AND VIETNAM, 2009**

	Peru		Senegal		Vietnam	
Number of caregivers included in dataset	3,602		2,037		3,090	
Number of caregivers alone at time of interview and for whom data was available	3,596		2,004		3,080	
<b>Self-reported handwashing with soap at critical times</b>						
After fecal contact	2,216	62%	592	30%	1,944	63%
Before food preparation	2,503	70%	249	12%	965	31%
Before feeding a child	1,153	32%	96	5%	1,025	33%
Before eating	—	—	313	16%	625	20%
At least one of these critical times	3,284	91%	927	46%	2,492	81%
All of these critical times	505	14%	7	<1%	225	7%
<b>Perception of best way to clean hands</b>						
Wash with water alone	433	12%	36	2%	406	14%
Wash with soap	3,068	85%	1,776	88%	2,579	86%
Wash with ash/mud	4	<1%	5	<1%	1	<1%
Other	47	1%	194	10%	0	0%
<b>Ratings of hand cleanliness</b>						
Palms observed (N)	3,596		2,008		3,074	
Clean	2,013	56%	1,688	84%	2,421	79%
Unclean appearance	894	25%	246	12%	593	19%
Visible dirt	689	19%	74	4%	60	2%
Fingerpads observed (N)	3,595		2,005		3,074	
Clean	2,010	56%	1,668	82%	2,406	78%
Unclean appearance	900	25%	259	13%	615	20%
Visible dirt	685	19%	78	4%	53	2%
Fingernails observed (N)	3,596		2,000		3,074	
Clean	1,536	43%	1,441	72%	1,947	63%
Unclean appearance	1,125	31%	351	18%	962	31%
Visible dirt	935	26%	208	10%	165	5%
Hand cleanliness index (N)*	3,594		1,992		3,074	
Very clean	1,493	42%	1,413	71%	1,932	63%
Somewhat unclean	1,254	35%	430	22%	1,026	33%
Very unclean	847	24%	149	7%	116	4%

\* The hand cleanliness index was calculated only for caregivers for whom all three aspects of the hand were observed.

**TABLE 8: OBSERVATIONS OF SOAP USE FOR HANDWASHING DURING STRUCTURED OBSERVATIONS, PERU AND SENEGAL, 2009**

	Peru (N = 159)				Senegal (N = 110)			
	All Household Members		Primary Caregivers		All Household Members		Primary Caregivers	
<b>Events of any type</b>								
At least one event of any type observed	159	100%	159	100%	110	100%	105	95%
Number of events observed (median and range)	11	4–50	8	1–22	9	1–31	3	0–11
Households with soap use at least once during observation	116	73%	89	56%	43	39%	28	27%
Proportion of events accompanied by soap use (median and range)	16%	0–67%	11%	0–100%	0	0–75%	0	0–100%
<b>Fecal contact events</b>								
At least one event observed	139	87%	132	83%	53	48%	37	34%
Number of events observed (median and range)	2	0–7	2	0–5	0	0–6	0	0–2
Households with soap use at least once after a fecal contact event	58	42%	53	40%	13	25%	11	30%
<b>Food preparation events</b>								
At least one event observed	148	93%	145	91%	63	57%	43	39%
Number of events observed (median and range)	2	0–6	2	0–6	1	0–6	0	0–5
Households with soap use at least once before a food preparation event	34	23%	32	22%	4	6%	3	7%
<b>Feeding events</b>								
At least one event observed	132	83%	132	83%	80	73%	77	71%
Number of events observed (median and range)	1	0–16	1	0–10	1	0–5	1	0–5
Households with soap use at least once before a feeding event	16	12%	16	12%	4	5%	3	4%
<b>Eating events</b>								
At least one event observed	141	89%	49	43%	80	73%	27	24%
Number of events observed (median and range)	2	0–11	0	0–4	1	0–12	0	0–2
Households with soap use at least once before an eating event	65	46%	12	17%	7	9%	2	7%



