**Global Scaling Up Handwashing Project**

# Scaling Up Handwashing Behavior:
## Findings from the Impact Evaluation Baseline Survey in Senegal

**Alexandra Orsola-Vidal & Ahmad Yusuf**

June 2011

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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.

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# Acknowledgements

As an integral component of the Water and Sanitation Program's (WSP's) Global Scaling Up Handwashing Project, a cross–country impact evaluation (IE) study is being conducted in Peru, Senegal, Tanzania, and Vietnam. This study is led by the World Bank's WSP IE Team.

The World Bank's Water and Sanitation Program Global Impact Evaluation Team in Washington, D.C., 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 project's Global Impact Evaluation Team oversees the IE 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 Senegal Impact Evaluation Team, led by principal and co-principal investigators Lucie Heinzerling and Alexandra Orsola-Vidal, oversaw the in-country design and field activities. Helene Benga provided in-country research and operations assistance and Ahmad Yusuf provided support with the data analysis and write up of this report.

The Senegal impact evaluation has also benefited from continuous support from Eduardo Perez, the global task team leader for the project; Seydou Koita, country task manager for the project in Senegal; Momar Kane, the Monitoring Information Systems (MIS) officer; and the global technical team comprised of Hnin Hnin Pyne, Jacqueline Devine, Nathaniel Paynter, and WSP support staff. Very special thanks to former Senegal task team leader, Ousseynou Diop (deceased November 2009) for his invaluable guidance and constant support.

The baseline survey was conducted by the Centre de Recherche pour le Développement Humain (CRDH) in Dakar, with management oversight from director Dr. Salif Ndiaye. A cadre of survey enumerators provided support. Photographs courtesy of Helene Benga and CRDH.

Finally, we wish to express our sincere gratitude to all the survey respondents for their generous donation of time and participation in this study.

# 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 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 four countries, 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, including:

- Mass media at national and local levels, carried on television and radio broadcasts, and billboards;
- Direct consumer contact events such as road shows, dramas, games, and street parades;
- Interpersonal communication activities conducted at the household level.

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 the 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.

## Senegal Intervention

In Senegal, the handwashing initiative started in 2003 when the Public-Private Partnership for Handwashing with Soap (PPPHW) was created with technical assistance from the Water and Sanitation Program (WSP). A first set of activities began in 2004 and culminated in 2007 with a 10-month communications campaign. A second phase was initiated in 2008 through WSP's Global Scaling Up Handwashing Project and activities were expanded to eight of the country's then 11 regions, with the objective of reaching over 1.5 million mothers with children under the age of five. The final objective is to improve the handwashing with soap practices of over 500,000 mothers and children. The target population includes mothers and other caregivers aged 14 to 49, and children up to 13 years of age living in urban and rural areas.

## Methodology and Design

The impact evaluation study utilizes a series of data collection activities to measure the impacts of the intervention, including baseline and post-intervention household and community surveys and longitudinal monitoring of diarrhea prevalence. In Senegal, the baseline survey, conducted between June and August 2009, collected information from a representative sample of the target population living in four regions. The survey comprised a total of 110 clusters

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

and 1,600 households within 88 *communes* and *communautés rurales*. The survey results offer data on the characteristics of household members, access to water, sanitation and handwashing facilities, handwashing behavior, prevalence of child diseases such as diarrhea and respiratory infection, child growth and development, anemia and parasites prevalence.

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. The main findings of the IE baseline survey in Senegal are presented in the next section.

## Summary of Findings

**Household Demographics, Access to Water and Sanitation** *Size, age, education, income*—Households average 12.2 members, with 2.7 children under age five. On average, the household head is 50.5; only 27% have attained secondary education and the majority (83 percent) are employed. The average monthly household income per capita is 10,778 CFA (equivalent to US$23).

*Access to water supply*—On average 70 percent of households have access to improved sources of drinking water. Access to improved water sources among the poorer households decreases to 37 percent; these households rely mainly on unprotected wells for water supply. Access to improved water varies significantly among regions; Fatick seems to be the least privileged of the regions.

*Access to sanitation*—On average, almost 70 percent of the households have access to improved sanitation, but over 20 percent practice open defecation. Access to improved sanitation varies largely among wealth quintiles. Among the wealthier households access to improved sanitation is 99 percent, and the most common sanitation facility is a flush toilet with septic tank. In contrast, among the poorer households access to improved sanitation is as low as 24 percent, and open defecation is practiced by the majority of households (58 percent). Among the four regions, Fatick also seems to have the lowest access to improved sanitation.

**Handwashing with Soap** *Handwashing with soap behavior*—Nearly all caregivers (97.4%), despite their socioeconomic status, reported washing their hands with soap at least once during the past 24 hours when prompted. However, when prompted for the occasions over the past 24 hours during which they washed their hands with soap, less than a quarter reported washing hands with soap at times of fecal contact (20.4% during toilet use and 13.8% cleaning children's bottoms), 12.4 percent reported handwashing with soap at times of cooking or food preparation, and fewer than 5% did so before feeding a child. Overall, only 37% of the caregivers reported having washed their hands with soap at a critical juncture in the previous day, and poorer households are half as likely to report handwashing with soap at critical times as wealthier households. True handwashing behavior with soap at critical junctures, observed through structured observations, is three times lower than self-reported rates.

*Access to place for handwashing*—A designated place for handwashing stocked with soap and water is observed only in a third of the households, and among poorer households a handwashing station with soap and water can be observed only in 12% of the households.

**Child Health** *Diarrhea prevalence*—One in 11 children under the age of five had diarrhea symptoms during the two weeks preceding the survey, one in ten during the previous week, and one in seven during the previous 48 hours. Diarrhea symptoms are less reported among households with a designated place for handwashing with soap and water. When diarrhea prevalence is disaggregated by wealth quintiles there seems to be no strong correlation between the two variables. However, diarrhea seems to vary by regions; for instance, diarrhea incidence was reported more than twice as high in Kaolack than in Fatick for all three-recall periods.

*Acute lower respiratory infection (ALRI) prevalence*—On average, 2.7 percent of children under the age of five presented ALRI symptoms during the previous 14 days preceding the survey, 2.5 percent during the previous week, and 1.8 percent during the previous 48 hours. ALRI prevalence seems higher among households with a designated place for handwashing with soap and water compared to

those without. These findings seem counterintuitive, as one would expect that more hygienic conditions would result in lower prevalence of ALRI. While the latter finding may appear counterintuitive, these differences are not statically different from zero. Surprisingly, ALRI symptoms are also higher among the wealthier quintiles. Regarding regional variation, the highest prevalence is among children living in St Louis for all three-recall periods, while it is lowest for children living in Fatick.

*Anemia*—The large majority (90.7%) of the samples taken indicated the presence of anemia. Anemia is lower for households with a designated place for handwashing (87.7%) and larger for those without (92.4%). The percentage is also a bit lower among children living in households with access to improved water sources and improved sanitation. Anemia prevalence does not seem to be correlated with wealth, as the lowest rates are observed among the 3rd and 5th quintiles, and the highest rates among the 1st, 2nd and 4th quintiles. Regarding different levels by regions, the percentage of anemia prevalence is also highest among children living in Kaolack and lowest among children living in Thiès.

*Parasitical infestations*— Stool samples were collected in a subsample of 100 households and tested for parasite prevalence. The most frequent parasites detected were *Giardia* and *Crystosporidium. Giardia* was detected in 11.2 percent of the samples, and *Crystosporidium* was found in 17.3%. The lowest prevalence of *Crystosporidium* is found among households with a handwashing station stocked with soap and water (11.1 percent vs. 19.7 percent for those without such facility). However, prevalence of *Giardia* does not follow the same pattern, and findings show higher levels of *Giardia* prevalence among households with access to improved water, improved sanitation, or a handwashing station with soap and water. Prevalence of parasites does not seem to be strongly correlated with wealth. It is worth noting that the sample size for parasite prevalence is very small (stool samples were collected in 99 households only) so not much weight should be allocated to these correlations.

**Nutrition and Child Development** *Nutritional status*—The three main nutritional status conditions concerned in anthropometric assessment are underweight, stunting, and wasting. On average, 10.2 percent of the children in the sample were underweight, 12.7 percent were stunted and 8.9 percent were wasted. Malnourishment rates are lower among households with access to a place for handwashing station with soap and water. Among children living in households with a place for handwashing, underweight is about four percentage points lower than those without a designated place (7.6% versus 11.4%); similarly, stunting is over 5 percentage points lower (8.9% versus 14.5%) and wasting almost three percentage points (6.8% versus 9.9%). When data is disaggregated by wealth, the most notable difference among wealth quintiles is for stunting, since the percentage of stunted children in the 1st or 2nd wealth quintiles (18.5% and 15.5%, respectively) is much higher than those in the wealthiest quintile (6.6%).

*Growth measures*—The survey included baseline growth measures of children under the age of two, including arm and head circumference, weight, and length/height. Anthropometric z-scores were estimated to assess child growth by comparing children in the sample to the WHO reference population mean and standard deviation, for each of the aforementioned variables. All measures, besides arm and head circumference, were found to be lower on average than the WHO reference population mean. Children coming from households with a designated place for handwashing, had higher z-scores for most anthropometric measures included in the analysis. Wealth is particularly correlated with weight-for-age and height/length-for-age, and not so much with the other anthropometric measures. When disaggregated by regions, figures do not vary much, but z-scores for five out of the six measures are lower in Kaolack than in the other regions.

*Child development*— An index of child development was developed for specific skills for age using an adaptation of the Ages and Stages Questionnaire, and included three domains: communication, social-personal and gross motor skills. For every type of skill a higher degree of development was systematically observed in those children that come from households with a designated place for handwashing with soap and water. When compared across the different wealth groups, the findings show a huge increase from the poorest to the wealthiest households; however, there are no uniform patterns between the 2nd to the 4th quintile. When disaggregating the findings by regions, Fatick far exceeds St Louis for all development z-scores.

# Abbreviations and Acronyms

| | |
|---|---|
| ALRI | Acute Lower Respiratory Infection |
| ASQ | Ages and Stages Questionnaire |
| BMI | Body Mass Index |
| C | Counterfactual or control group |
| CFA | West African CFA Franc |
| CRDH | Centre de Recherche pour le Développement Humain |
| DCC | Direct Consumer Contact |
| DHS | Demographic Health Survey |
| Hb | Hemoglobin |
| HH(s) | Household(s) |
| HW | Handwashing |
| IE | Impact evaluation |
| IPC | Interpersonal Communications |
| MIS | Monitoring and Information Systems |
| NGOs | Non-governmental organizations |
| PPPHW | Public-Private Partnership for Handwashing |
| SD | Standard deviation |
| SNDHS | Senegal Demographic Health Survey |
| T | Treatment |
| USD | United States Dollar |
| WHO | World Health Organization |
| WSP | Water and Sanitation Program |

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# I. Overview

## 1.1 Introduction

In December 2006, in response to the preventable threats posed by poor sanitation and hygiene, 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 (HWWS) 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 for 5.4 million people in Peru, Senegal, Tanzania, and Vietnam.

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 benefit, rates of handwashing with soap at critical times are very low throughout the world.

The project aims to test whether this handwashing behavior can be improved 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, at project end, it 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 age five. The project further 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 twenty countries by 2020.

The project's global activities test innovative approaches at scale and have 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, and
- Develop and disseminate evidence-based knowledge products and conduct advocacy to position handwashing as a global public health priority, leading to the adoption of effective hand-washing programs in additional countries.

The project also aims to complement and improve upon existing hygiene behavior change and handwashing approaches, and to enhance them with novel approaches—including social and commercial marketing—to deliver handwashing with soap messages, along with broad and inclusive partnerships of government, private commercial marketing channels, and concerned consumer groups and non-governmental organizations (NGOs). These innovative methods will be combined with proven community-level interpersonal communications 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 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 the magnitude of these impacts, the project implemented a randomized-controlled trial impact evaluation

(IE) of the project in the four countries, using household surveys to measure the levels of key indicators.

This report is part of a series presenting the analysis of baseline data collection surveys 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 hand-washing and sanitation projects at scale on 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 anemia, and productivity of mothers' time, among others.

The studies will provide a better understanding of at-scale sanitation and hygiene interventions. The improved evidence will support development of large-scale 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

The overall objective of the project is to improve the health of populations at risk of diarrhea and acute lower respiratory infections (ALRI), especially in children under five years old, through a strategic communications campaign aimed at increasing handwashing with soap behavior at critical times. Children under five represent the age group most susceptible to diarrheal disease and acute 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 being in contact with child's feces).

In Senegal, the project targets mothers/caregivers of school children living in urban and rural areas, and it is aimed at improving handwashing with soap practices. In an effort to induce improved handwashing behavior, the project developed a research-based behavior change approach, borrowing from both commercial and social marketing fields. This entails the design of communications interventions and messages based on existing data on what is likely to bring about the desired behavior change. The data is derived from formative research and/or literature. The communications interventions are then implemented and delivered strategically so that the target audiences are "surrounded" by handwashing promotion. Some key elements of the intervention include:

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

## 1.3 Project Components

In Senegal, the handwashing initiative started in 2003, when the Public-Private Partnership for Handwashing with Soap (PPPHW) was created with technical assistance from the Water and Sanitation Program (WSP). Housed initially within the Office Nationale de L'Assainissement, the government unit overseeing sanitation within the Ministry of Health, the PPPHW's main objective was to catalyze and coordinate multi-sectoral involvement in the promotion of handwashing with soap.[2]

The first phase of activities began in 2004 and culminated in 2007 with a 10-month communications campaign. The campaign included nationally aired television and radio spots, education-entertainment events in market places, and small-group discussions conducted with women's associations and in the waiting rooms of health centers.[3]

[2] For more information on the PPPHW, see www.globalhandwashing.org.
[3] Small-group discussions were conducted in three regions, Thies, Diourbel and Dakar, and in one department, Velingara.

A second phase of activities was initiated in 2008 through WSP's Global Scaling Up Handwashing Project. During this second phase, activities in Senegal were expanded to eight of the country's then 11 regions[4], with the objective of reaching over 1.5 million mothers with children under the age of five through an integrated behavior change approach by the end of 2010.[5] The final objective is to improve the handwashing with soap practices of over 500,000 mothers and children. In parallel, efforts were directed at strengthening the enabling environment to ensure that activities and outcomes would be sustained after project end. The target population for the intervention is mothers and other caregivers age 14 to 49, and children up to 13 years of age living in urban and rural areas.

The impact evaluation aims to evaluate the combination of three different components of Phase 2 activities:

- **Component 1—Mass Media Campaign**
  The mass media campaign is carried out at national (Component 1a) and local levels (Component 1b) and reaches a large number of the target audience. The main means of communication are television, radio broadcast, and mid-sized billboards, as these are useful in conveying the overarching concept of a campaign and providing an umbrella slogan or visuals for all other channels. The communication messages focus on caregivers' commitment to promote handwashing behavior with soap among their family members, and to make water and soap available in key locations of the household.
- **Component 2—Direct Consumer Contact (DCC)**
  Used by commercial firms in their brand marketing efforts, DCC provides an opportunity to engage and interact with the audiences at the community level. The objective of this component is to reach mothers, caregivers, and children in public places to stimulate handwashing behavior using an entertainment-education approach. DCC invites local authorities to participate; events include road shows, dramas, games, and street parades conducted in marketplaces and other public spaces in the community.
- **Component 3—Interpersonal Communication (IPC)**
  Interpersonal communication is conducted at the household level and focuses on influencing other handwashing determinants such as beliefs or skills for which mass media is less suited. It consists of one-on-one communications with caregivers of children under five years old and with children between 5 and 13 years of age. It is handled by *relays* (fieldworkers) who have previously worked on other public health issues, and whose main responsibility is to reach and convince caregivers to set up designated areas for handwashing (i.e., handwashing stations) to provide convenient access to soap and water when and where needed.

## 1.4 Objectives of the Study

The objective of the IE is to assess the effects of the handwashing 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 health and development outcomes. In particular, it will provide information on the extent to which improved handwashing behavior alters infant health and welfare.

The IE aims to address the following primary research questions and associated hypotheses:

1. What is the effect of handwashing promotion on handwashing behavior?
2. What is the effect of handwashing promotion 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 information for the selected indicators and outcomes of interest included in the survey.

[4] At the time of the project design Senegal had eleven regions; three regions were added in September 2008.

[5] For more information, see Senegal: A Handwashing Behavior Change Journey, available at www.wsp.org/scalinguphandwashing.

# II. Methodology

## 2.1 Randomization

To address the proposed research questions, a proper IE methodology is needed to establish the causal linkages between the project and the outcomes of interest. In order to estimate the causal relationship between the 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, and that an appropriate counterfactual can be measured.[6] 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 project intervention, where assessment of implementation spans over a year and a half, it is possible that factors such as weather, macro-economic shocks, 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 project (e.g., diarrhea incidence in young children, health, and welfare). If no control group is maintained and a simple pre- to post-assessment is conducted of the project, the observed changes in outcomes cannot be causally attributed to the intervention.

Random assignment of treatment helps to prevent additional problems that affect certainty that the observed changes in outcomes are due to the intervention. For instance, in many cases, communities chosen for health or development programs such as the 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.[7] 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 1.

## 2.2 Study Design

In order to measure the health and development impacts of the project, the IE utilizes an experimental design with one treatment and one control group, which serves as the counterfactual. Treatment consists of all project components: national mass media campaign (Component 1a), local mass media campaign (Component 1b), DCC (Component 2) and IPC activities (Component 3). The control group receives only the national mass media campaign (Component 1a), since it is implemented at the national level. This study design makes it possible to investigate the net impact of Component 1b, 2, and 3, by comparing a treatment group exposed to all components (1a, 1b, 2, and 3) relative to a control group that only receives Component 1a. Both the treatment and control groups comprise a representative sample of the population of households with at least one child under the age of two at baseline.

## 2.3 Sampling Strategy and Sample Size

The primary objective of the project is to improve the health and welfare of young children. Thus, a sufficient sample size (total number of households included in the IE

[6] 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.

[7] Hernan 2004.

**MAP 1:** REGIONS SELECTED FOR HANDWASHING PROJECT IMPACT EVALUATION


survey) 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.[8] By focusing on households with children under two at the time of the baseline (i.e. children will be under five by the time of the endline survey), the evaluation aims to capture changes in outcomes for the age range during which children are most sensitive to changes in hygiene behavior. Power calculations indicated that approximately 800 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 (loss of participants during the implementation of the project) during the project study phase. Therefore, since the evaluation consists of one treatment group and one control group, the total sample incorporates 1,600 households, each of which has at least one child younger than two years of age at the time of the survey.

Households were randomly selected from a total of 110 clusters in 88 *communes* and *communautés rurales* in four regions of Senegal. The selection of regions was not random, and was instead discussed and agreed upon by the country implementation team and the survey firm. Although the project comprises eight regions, the IE study includes only four, as it excludes those regions with, or at risk for, a recent episode of cholera.[9] The four selected regions for the IE study were Fatick, Kaolack, Saint-Louis, and Thiès (see Map 1).

The methodology to select the sample used a three-stage design.

First, a selection of *collectivités locales*, including *communes and communautés rurales*, was drawn from the universe of *communes* and *communautés rurales* included in the four selected regions. Two c*ollectivités locales*—*Commune de Thiès* and *Touba Mosquée*—were excluded from the sampling universe due to a population size that was larger than the rest (*Touba Mosquée* was close to 500,000 residents and *Commune de Thiès* was around 250,000 residents; the population of the next seven largest cities was between 171,000 and 113,000); from the remaining list the largest 88 *collectivités locales* were randomly selected.

Second, a selection of clusters or Census Districts[10] was drawn from the universe of clusters included in the 88 *collectivités locales* randomly selected for the study. Clusters were randomly selected with a probability proportional to the number of clusters in each *collectivité locale.* A total of 110 clusters were selected, out of which 55 were then randomly assigned to the treatment arm and the other 55 to the control group.

Third, a selection of households was randomly drawn among all households within the selected clusters that had at least one child younger than two years of age, and was proportional to the number of households per cluster.

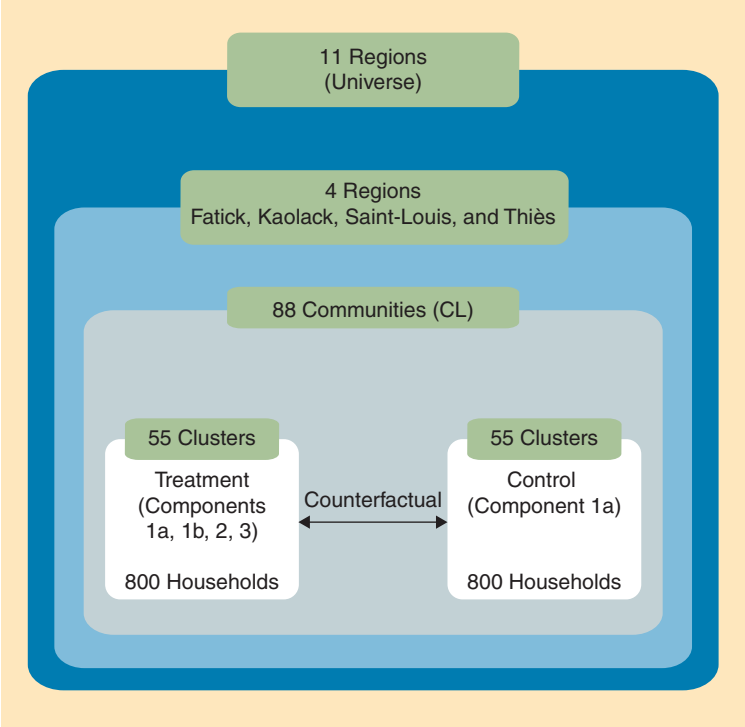
This sample selection process explained above is illustrated in Figure 1. Further details on the selected list of *collectivités locales* and clusters can be found on Map 2 and in Annex 1.

[8] A minimum effect size of 20 percent will allow the identification of a 20 percent reduction in diarrhea prevalence from the baseline level. Therefore, if diarrhea prevalence during the baseline survey is 10 percent, the IE will capture any reductions over two percentage points, i.e., if diarrhea prevalence drops below 8 percent.

[9] Cholera-related morbidity, prevention efforts, and transient cholera-related behavior changes would have dominated any intended program impacts, and would not inform the likely handwashing behavior change program effects in a non-cholera endemic setting.

[10] In accordance with the definition given by the General Census of the Population and Housing done in 2002.

**FIGURE 1:** DESIGN OF IMPACT EVALUATION IN SENEGAL




## 2.4 Variables for Data Analysis

The IE aims to assess both the effect of promotion of handwashing with soap on handwashing behavior and the effect of the project on infant health and welfare. In order to measure potential impacts of the intervention the study will collect data on diarrhea, productivity, education, nutrition, child growth and development, iron deficiency, environmental contamination, parasite prevalence, and handwashing behavior and its determinants.

The above variables will be collected through three different surveys: the *baseline* survey, collected before the intervention and reported on here; the *longitudinal* surveys, collected a total of three times prior to the intervention and three times 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. This sample selection process explained above is illustrated in Figure 1. Further details on the selected list of collectivités locales and clusters can be found on Map 2 and in Annex 1.

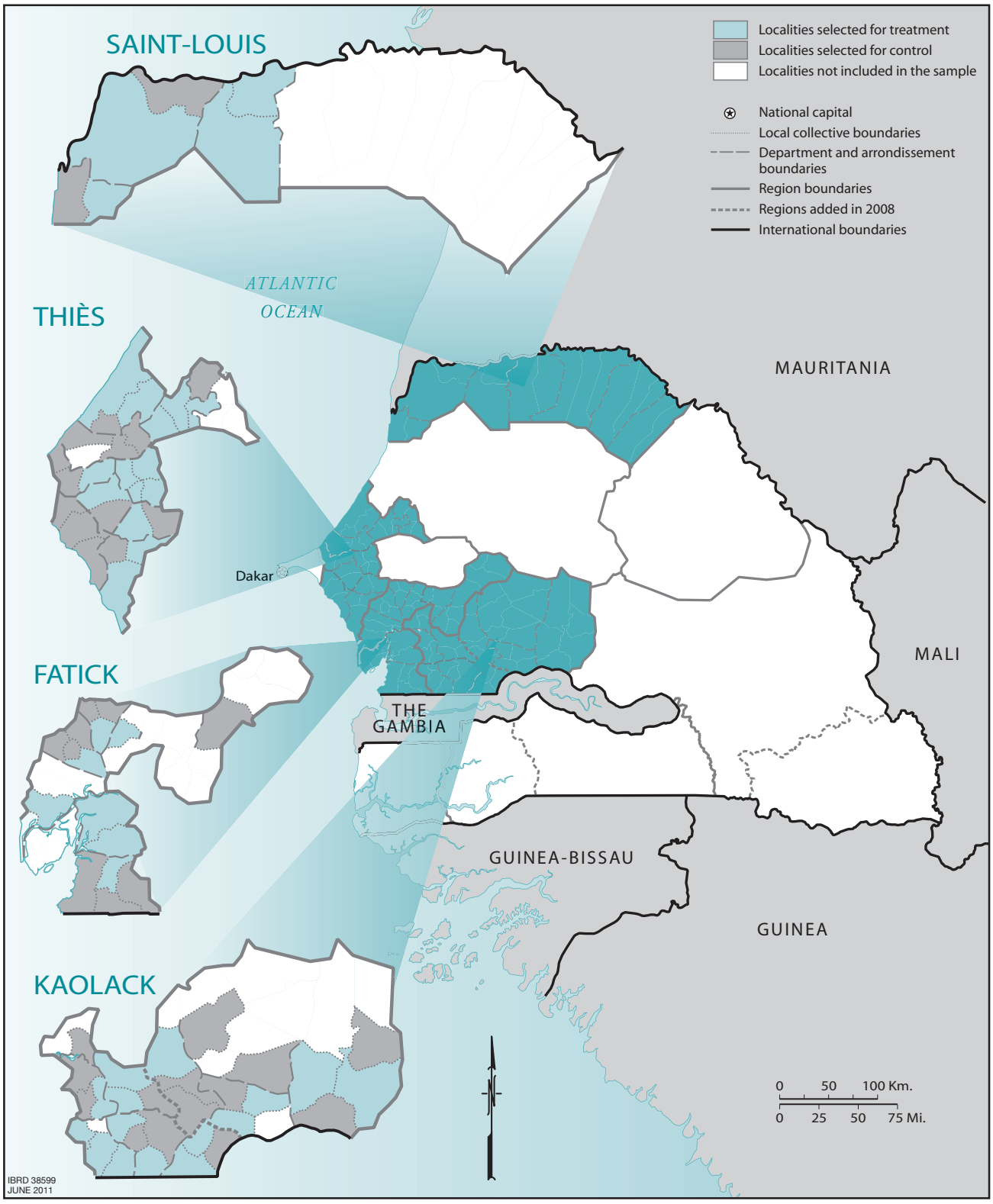
## 2.5 Instruments for Data Collection

The baseline survey was conducted June through August 2009. The expectation was to conduct a total of 1,600 household questionnaires and 110 community questionnaires (one per *cluster*) in 88 *collectivités locales*. By the end of the survey, data were collected from 1,550 households and 110 clusters within 88 *collectivités locales*.

The baseline survey included the following instruments:

- **Household questionnaire**: The household questionnaire was conducted in all 1,550 households in 110 clusters to collect data on household membership, education, labor, income, assets, dwelling characteristics, water sources, drinking water, sanitation, observations of handwashing facilities and other dwelling characteristics, handwashing behavior, child discipline, maternal depression, handwashing determinants, exposure to health interventions, relationship between family and school, and mortality.

**MAP 2:** LOCALITIES SELECTED FOR HANDWASHING PROJECT IMPACT EVALUATION[11]




[11] Since the time of the baseline survey, three new regions were created, when on 10 September 2008 Kaffrine region was split from Kaolack, Kédougou region was split from Tambacounda, and Sédhiou region was split from Kolda.

**BOX 1:** HEALTH AND WELFARE IMPACTS

| What Is Measured? | How Is It Measured? | Measuring Instrument |
|---|---|---|
| Diarrhea prevalence | Caregiver-reported symptoms collected in a 14-day health calendar | Household questionnaire |
| Productivity of mothers' time | Time lost to own and child's illness | Household questionnaire |
| Education Benefits | School enrollment and attendance | Household questionnaire |
| Child growth | Anthropometric measures: weight, height/length, arm and head circumferences[12] | In household collection of anthropometric measures |
| Child development | Caregiver reported personal-social, communications, and gross motor skills | Modified Ages & Stages Questionnaire (ASQ)[13] |
| Anemia | Hemoglobin concentration (<110g/L per international standards)[14] | In household collection and analysis of capillary blood using the HemoCue photometer |
| Parasite prevalence | Parasite prevalence in fecal samples | In household collection of samples, and parasitological analysis in lab |

**BOX 2:** HANDWASHING BEHAVIOR AND DETERMINANTS

| What Is Measured? | How Is It Measured? | Measuring Instrument |
|---|---|---|
| Handwashing w/ soap behavior | Direct observation of handwashing station stocked with soap and water | Household questionnaire |
| | Self-report handwashing with soap behavior | Household questionnaire |
| | Observed handwashing with soap behavior | Structured observations |
| Determinants to handwashing with soap behavior[15] | Opportunity, ability, and motivation determinants | Household questionnaire |

- **Health questionnaire**: The health questionnaire was conducted in all 1,550 households in 110 clusters 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 110 clusters, to collect data on: socio-demographics of the 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.
- **Structured observations**: Structured observations were conducted in a subsample of 110 households to collect data on direct observation of handwashing behavior.

[12] Habitcht 1974.
[13] Bricker & Squires 1999.
[14] Stoltzfus & Dreyfus 1999.
[15] The analysis for determinants to handwashing with soap behavior change is not included in this report.

- **Stool samples**: Stool samples were collected in a subsample of 110 households[16] to identify prevalence of parasites in children's feces.

The WSP global impact evaluation team, consisting experts from different disciplines, drafted the survey instrument. The complete survey instrument, which included a set of household, community and longitudinal questionnaires, was translated into French and pre-tested in 40 households prior to use in the baseline survey. Although the instruments were written in French, they were administered and answered by respondents in Wolof, the local language.[17] This is a standard practice in Senegal, where all documents are written in French but the spoken language is Wolof.

Anemia was assessed in children under the age of two years using an in-household collection method. Hemoglobin concentrations were measured 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 stadiometers, scales, and measuring tape to measure height/length, weight, and arm and head circumference.[18]

After the household questionnaires were administered, structured observations of handwashing behavior were collected the same or the following day, during a five-hour period, by observing handwashing behavior of the primary caregiver of a child under two years old. Opportunities for handwashing for persons other than the primary caregiver were also noted if the individual came into the line of sight of the observer.

[16] Stool samples were to be collected in 110 households, but actual samples were obtained from 99 households.
[17] 98 percent of the surveys were administered and answered by respondents in Wolof; the other 2 percent were administered either in French or one of the other three local languages spoken in Senegal.
[18] Habicht 1974.

During the five-hour period, the observer noted any opportunity for handwashing and whether handwashing occurred during that time, as well as the details of the opportunity: the type of critical event, the cleansing agent used (e.g., bar soap, liquid soap, mud), washing of one or both hands, and method of hand drying. Critical events of interest included fecal contact (going to the toilet, defecating, or changing children's diapers), preparing food, eating, or feeding children.

A total of three pre-intervention longitudinal surveys and three mid-term monitoring surveys were conducted during the study. The post-intervention follow-up survey will be conducted in early 2011 and will collect data on the majority of outcomes collected during the baseline survey (some variables the were collected during the baseline survey as control variables are not outcomes of interest and will not be included in the follow-up survey).

## 2.6 Field Protocols

The Centre de Recherche pour le Développement Humain (CRDH) was contracted to conduct field work for the baseline survey. With support from the principal investigator, the research assistant, and the global IE team, CRDH researchers trained field supervisors and enumerators on all data collection protocols and instruments, and were in charge of the standardization of anthropometric and anemia measures.

Each field survey team consisted of one team supervisor, a lab technician and three or four interviewers. There were eight survey teams and a total of 44 field workers. Each supervisor was in charge of overseeing one team, administering the community questionnaire, recording the GPS location of the cluster, and collecting anthropometric measures. The lab technician was in charge of conducting anemia tests and collecting fecal samples. The interviewers were in charge of administering the household and health questionnaire (besides anthropometry and anemia measures). Interviewers were also in charge of the structured observations in those households where these were conducted.

Specific training was designed for each member of the survey team according to the specific needs required of the task to be performed in the field.

# III. Findings

Poorer households are half as likely to report handwashing with soap at critical times as wealthier households. This section presents summary descriptive statistics for key demographic, socioeconomic, hygiene, access to water and sanitation, health, and child development variables. Findings are cross-tabulated by household wealth and region, and for child outcomes of interest such as diarrhea, ALRI, anemia, growth and development measures, and parasite prevalence. Key findings are also cross-tabulated by sanitary conditions. 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 related to child health and development; however, no causality can be inferred between the variables from this bivariate analysis.

In the absence of income expenditure, an asset-based wealth index was created using ownership of durable goods and dwelling characteristics. The durable goods included in the index are radio, television, DVD player, computer, refrigerator, bicycle, motorcycle, car, gas stove, and water boiler. The dwelling indicators included type of dwelling (e.g. house/hut or apartment); materials used to build wall, roof and floor; dwelling lighting source; cooking energy source; and the number of rooms per household size. In addition, indicators for improved sanitation and water facilities are included in the index. The procedure uses principal components analysis to assign relative weights to each indicator variable using a methodology developed by Filmer and Pritchett.[19]

In terms of regional analysis the set of variables mentioned above were cross-tabulated by each of the four regions included in the study. Senegal is a small country and regional differences among the four selected regions are not large; however, it is interesting to see if the outcomes of interest vary among regions. Each region includes both urban and rural zones. Saint-Louis is in the northwest corner of the country, along the border with Mauritania. It includes coastal areas and the southern bank of the Senegal River, which constitutes the border between Senegal and Mauritania. The other three regions—Thiès, Fatick, and Kaolack—are all in central Senegal, in the interior east of Dakar. Fatick and Kaolack border with The Gambia, and Kaolack is the only interior region of the four, with no coastal areas. The predominant climate in all four regions is tropical arid, with a rainy season from May to November.

## 3.1 General Households Characteristics

**Key Findings:**

- Households in Senegal are large; the average household is comprised of 12 members, out of which 2.7 are children under 5 years of age, and the average total monthly income per capita is 10,778 CFA (equivalent to US$23).
- Most households have a 50 year old male as a head; only 27 percent have ever attended school.
- The average monthly salary, including primary and secondary jobs, is 45,549 CFA (equivalent to US$97), although among poor households salaries are roughly half of that (23,440 CFA, equivalent to US$50).
- The average household among the poorer have no electricity, use wood for cooking and their dwellings are made of mud walls and dirt floors.

Table 1 shows a summary of household basic socio-economic characteristics. The average household (HH) comprises 12.2 individuals, among whom 2.7 are under the age of five. A man heads 87.2 percent of the households. The head of the household is, on average, 50.5 years of age and only 27.6 percent have ever attended school. Around 83 percent of the household heads are employed, and their average monthly salary is 81,171 CFA[20] (equivalent to US$172).[21] The mean age of the household members is 20.3. There is a higher proportion of females (53.4 percent) than males (46.6 percent) in this sample. Other household members are, on average, much younger (17.6 years old) and more educated (about 44 percent have some level of school attendance). Less than half

[19] Filmer and Pritchett 1999 and 2001. For the binary indicators, the missing values were imputed to be zero (Filmer and Scott, 2001). Missing indicators did not exceed 2 percent of the number of households).

[20] The average income throughout this report only includes individuals who reported positive income.

[21] The USA-CFA exchange rate was provided by the Central Bank of West African States (BCEAO) on October 15, 2010 (1 US$= 471.92 CFA).

**TABLE 1:** SUMMARY STATISTICS

| | Mean |
|---|---|
| HH size | 12.2 |
| Number of children under five yrs per HH | 2.7 |
| **HH Head:** | |
| Male (% HH) | 87.2% |
| Age | 50.5 |
| Ever attended school (% HH heads) | 27.6% |
| Worked outside household in last 12 months (% HH heads) | 82.6% |
| Monthly labor income (in CFA) | 81,171 |
| **Other HH Members:** | |
| Male (% HH) | 43.0% |
| Age | 17.6 |
| Ever attended school (% other HH members, age >4) | 43.7% |
| Worked outside household in last 12 months (% other HH members, age >14) | 47.1% |
| Monthly labor income (in CFA) | 34,360 |
| **All HH members:** | |
| Male (% individuals) | 46.6% |
| Age | 20.3 |
| Ever attended school (% Individuals, age>4) | 42.0% |
| Worked outside household in last 12 months (% individuals, age>14) | 53.0% |
| Monthly labor income (in CFA) | 45,549 |
| HH monthly income per capita (in CFA) | 10,778 |

of the other household members are employed and their average monthly salary is 34,360 CFA (equivalent to US$73). Finally, the average household monthly income per capita is 10,778 CFA (equivalent to US$23).

The following tables provide a more detailed description of the socio-demographic and socio-economic characteristics of the household by wealth quintiles. Table 2 presents the distribution of basic household demographic variables: age of the household members, household size, and total number of children under the age of five per household. On average, poorer households are composed of younger members. In the bottom quintile, for instance, 25 percent of the household members are under four years old, and 18.6 percent between five and nine, compared to 19.6 percent and 12.3 percent in the wealthiest households. The mean household size is the lowest among the poorest quintile, 11.2 members, it increases in size until the 4th quintile up to 13.5 members, and then decreases again to 12 members, so no clear pattern can be observed between wealth and household size. It is worth noting that over a quarter of the households (28.7 percent) are comprised of 15 or more members, and 5.2 percent of the households have over 25 members. Again these figures are the lowest among the poorest households, which seem to have smaller household sizes on average.

Asset and non-labor income information is summarized in Table 3. The findings show that almost 29 percent of the households declared having income sources other than labor. Non-labor incomes are more common among wealthier households (40.3 percent) than among the poorest (20.1 percent). The average non-labor income is 11,141 CFA (equivalent to US$24) per household. Non-labor incomes among the poorer households are 3,253 CFA compared to 21,386 CFA in the wealthiest households (equivalent to US$7 and US$45 respectively). The findings about assets show that the majority of the households (70.2 percent) have a radio, cassette, or CD player. This percentage is higher for the wealthier households at 87.7 percent. Owning luxury items such as television or VCR will vary highly based on wealth-index status; for instance, 97.4 percent of the wealthiest households have a television, while the percentage for poorest households is barely over 2.6 percent. On average, only 11.1 percent of households have a refrigerator, and the figure is insignificant for the poorest households, almost 0 percent. On average 42.9 percent of the households have some type of stove (either gas or non-gas). Cooking stoves are highly correlated with wealth; thus, only 8.7 percent of the poorest households have some type of cooking stove compared to 81.3 percent among the wealthiest households.

Table 4 shows household dwelling characteristics. More than one-third of households live in a detached, independent dwelling. The average number of rooms per dwelling is 4.9. A majority of households live in a single unit such as a house, building, or hut (41.7 percent), or in a unit part of a compound (41 percent).

Table 5 shows the main materials used to build the dwelling. Two thirds of the households, 67.3 percent, have walls made

**TABLE 2:** PERCENT DISTRIBUTION OF THE BASIC SOCIO-DEMOGRAPHIC CHARACTERISTICS

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Age (% individuals):** | | | | | | |
| 0–4 | 25.0% | 22.6% | 22.6% | 21.0% | 19.6% | 22.1% |
| 5–9 | 18.6% | 18.5% | 17.0% | 15.5% | 12.3% | 16.3% |
| 10–14 | 10.2% | 11.6% | 12.3% | 12.1% | 10.6% | 11.4% |
| 15–19 | 8.0% | 9.1% | 8.8% | 9.2% | 9.8% | 9.0% |
| 20–24 | 7.2% | 7.1% | 7.7% | 8.5% | 10.6% | 8.2% |
| 25–29 | 5.8% | 5.7% | 5.6% | 6.8% | 8.4% | 6.4% |
| 30–34 | 5.1% | 5.0% | 5.1% | 6.3% | 6.5% | 5.6% |
| 35–39 | 5.3% | 4.2% | 4.8% | 4.6% | 5.1% | 4.8% |
| 40–44 | 3.1% | 3.3% | 3.4% | 2.9% | 3.9% | 3.3% |
| 45–49 | 3.0% | 3.2% | 2.7% | 2.9% | 2.9% | 2.9% |
| 50+ | 8.6% | 9.7% | 10.0% | 10.2% | 10.5% | 9.8% |
| Age of HH head (average) | 46.1 | 51.4 | 51.5 | 50.8 | 52.5 | 50.5 |
| Age of other HH members (average) | 16.3 | 16.8 | 17.1 | 18.3 | 19.3 | 17.6 |
| HH head is male (% HH heads) | 96.5% | 95.2% | 88.4% | 81.6% | 74.5% | 87.2% |
| Other HH member is male (% other HH members) | 37.3% | 40.2% | 40.1% | 40.5% | 38.8% | 39.4% |
| **HH Size:** | | | | | | |
| 2 | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.1% |
| 3 | 0.3% | 1.0% | 1.3% | 2.6% | 4.2% | 1.9% |
| 4 | 2.6% | 1.9% | 2.3% | 2.6% | 3.2% | 2.5% |
| 5 | 4.5% | 4.5% | 4.2% | 3.2% | 6.8% | 4.6% |
| 6 | 8.1% | 6.8% | 5.8% | 7.1% | 5.8% | 6.7% |
| 7 | 10.0% | 8.7% | 9.0% | 8.7% | 6.1% | 8.5% |
| 8 | 11.0% | 8.1% | 9.7% | 4.5% | 6.8% | 8.0% |
| 9 | 8.4% | 9.7% | 5.8% | 9.0% | 10.0% | 8.6% |
| 10 | 9.7% | 5.5% | 7.7% | 6.5% | 8.4% | 7.5% |
| 11 | 7.1% | 7.4% | 8.7% | 4.8% | 6.1% | 6.8% |
| 12 | 8.4% | 6.5% | 6.1% | 4.2% | 4.8% | 6.0% |
| 13 | 5.2% | 5.5% | 6.5% | 4.5% | 4.2% | 5.2% |
| 14 | 4.2% | 6.1% | 2.9% | 5.8% | 5.8% | 5.0% |
| 15–19 | 13.5% | 16.5% | 16.8% | 18.7% | 15.8% | 16.3% |
| 20–24 | 4.5% | 8.1% | 7.7% | 8.7% | 6.8% | 7.2% |
| 25+ | 2.6% | 3.9% | 5.2% | 9.0% | 5.2% | 5.2% |
| HH size (average) | 11.2 | 12.2 | 12.3 | 13.5 | 12.0 | 12.2 |
| **Total Number of Children Under Five Years of Age:** | | | | | | |
| 1 | 17.7% | 17.1% | 19.0% | 20.3% | 34.3% | 21.7% |
| 2 | 35.8% | 36.1% | 36.1% | 36.1% | 34.6% | 35.8% |
| 3 | 21.6% | 19.7% | 20.0% | 17.4% | 12.9% | 18.3% |
| 4 | 11.9% | 15.5% | 11.9% | 10.3% | 9.4% | 11.8% |
| 5 | 6.5% | 7.1% | 6.5% | 7.4% | 4.5% | 6.4% |
| >5 | 6.5% | 4.5% | 6.5% | 8.4% | 4.2% | 6.0% |
| Number of children under five years of age (average) | 2.8 | 2.8 | 2.7 | 2.8 | 2.3 | 2.7 |

**TABLE 3:** PERCENT DISTRIBUTION OF HOUSEHOLDS ASSETS AND NON-LABOR INCOME

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| HH has non labor income (%HHs) | 20.1% | 21.3% | 30.7% | 32.6% | 40.3% | 29.0% |
| Average HHs non labor income in CFA | 3,253 | 5,759 | 10,176 | 14,682 | 21,836 | 11,141 |
| **HH Assets:** | | | | | | |
| Radio, CD, cassette | 55.8% | 65.2% | 72.8% | 69.9% | 87.7% | 70.3% |
| TV | 2.6% | 9.4% | 21.3% | 76.8% | 97.4% | 41.5% |
| VCR/DVD | 0.0% | 1.0% | 1.3% | 19.1% | 64.8% | 17.2% |
| Computer | 0.0% | 0.0% | 0.3% | 1.3% | 12.1% | 2.7% |
| Bicycle | 5.2% | 8.4% | 6.8% | 8.4% | 15.5% | 8.9% |
| Motorbike | 1.0% | 3.2% | 3.6% | 8.4% | 15.6% | 6.3% |
| Automobile or truck | 0.0% | 0.0% | 1.0% | 2.3% | 16.3% | 3.9% |
| Refrigerator | 0.0% | 0.0% | 1.0% | 6.8% | 47.6% | 11.1% |
| Gas stove | 0.3% | 0.6% | 5.2% | 8.7% | 10.1% | 5.0% |
| Other stove | 8.4% | 21.0% | 39.2% | 50.0% | 71.2% | 37.9% |
| Mixer | 0.0% | 0.0% | 1.0% | 1.3% | 2.0% | 0.8% |
| Toaster | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Microwave | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Washing machine | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.1% |
| Water boiler | 0.0% | 0.3% | 0.0% | 0.0% | 1.6% | 0.4% |
| Other house, building | 0.6% | 1.9% | 2.6% | 5.2% | 4.9% | 3.1% |
| Machinery, equipment for household business | 8.5% | 4.9% | 7.5% | 5.9% | 5.3% | 6.4% |
| HH owns other piece of land | 89.3% | 76.8% | 72.6% | 52.6% | 34.8% | 65.2% |
| HH owns farm equipment | 91.6% | 86.5% | 78.7% | 49.0% | 14.8% | 64.1% |
| HH has animals | 95.5% | 90.6% | 88.1% | 72.6% | 56.8% | 80.7% |
| Number of livestock owned per HH (average) | 3.70 | 3.37 | 3.12 | 2.02 | 1.17 | 2.68 |

of brick, 22.6 percent and 2.3 percent have mud and wood/logs walls, respectively. The use of other walling materials like bamboo, tin/zinc sheeting, and unbaked brick is rare, regardless of the wealth group. Tin/zinc sheeting is the most common roofing material (56.0 percent), followed by concrete (6.0 percent), wood/logs (5.3 percent) and brick (4.3 percent). In 46.4 percent of the dwellings the floor is cement and in 25.6 percent of the dwellings the material used was mud or sand.

The survey also included information regarding the dwelling's lighting source and the type of fuel used for cooking and heating (Table 6). In 37.8 percent of the surveyed households, electricity was the primary lighting source, with battery being the second alternative (23.7 percent). Almost 74 percent of the households use wood as the primary cooking fuel (97.1 percent of the poorest households), followed by gas (16.5 percent of the total number of households); however gas was not used in the poorest households.

**TABLE 4:** DWELLING CHARACTERISTICS

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Type of Dwelling (% HHs):** | | | | | | |
| House, building or hut | 14.8% | 33.9% | 46.3% | 46.3% | 67.4% | 41.7% |
| Apartment | 0.0% | 1.3% | 2.6% | 7.8% | 9.4% | 4.2% |
| Room(s) in a house, apartment or concession | 10.6% | 9.4% | 12.3% | 16.8% | 13.2% | 12.5% |
| Unit in concession or compound | 73.5% | 54.1% | 38.8% | 28.8% | 10.0% | 41.0% |
| Makeshift dwelling | 1.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% |
| Other | 0.0% | 1.3% | 0.0% | 0.3% | 0.0% | 0.3% |
| Average number of rooms | 4.4 | 4.5 | 4.8 | 5.4 | 5.5 | 4.9 |

**TABLE 5:** DWELLING BUILDING MATERIALS

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Walling Materials (% HHs):** | | | | | | |
| Brick | 5.5% | 45.7% | 90.6% | 94.8% | 99.4% | 67.3% |
| Concrete | 4.9% | 2.3% | 0.3% | 1.3% | 0.6% | 1.9% |
| Unbaked brick, adobe | 1.3% | 0.3% | 0.0% | 0.0% | 0.0% | 0.3% |
| Wood, logs | 5.9% | 4.6% | 1.0% | 0.0% | 0.0% | 2.3% |
| Tin, zinc sheeting | 0.0% | 2.0% | 1.6% | 1.0% | 0.0% | 0.9% |
| Mud | 73.3% | 33.6% | 3.9% | 2.6% | 0.0% | 22.6% |
| Bamboo | 3.3% | 3.9% | 1.3% | 0.3% | 0.0% | 1.8% |
| Other | 5.9% | 7.6% | 1.3% | 0.0% | 0.0% | 2.9% |
| **Roofing Materials (% HHs):** | | | | | | |
| Brick | 0.0% | 1.3% | 3.6% | 5.8% | 10.7% | 4.3% |
| Concrete | 0.0% | 0.3% | 1.3% | 3.9% | 24.3% | 6.0% |
| Unbaked brick, adobe | 0.0% | 0.0% | 0.0% | 0.6% | 1.9% | 0.5% |
| Wood, logs | 19.9% | 5.6% | 0.0% | 0.6% | 0.3% | 5.3% |
| Tin, zinc sheeting | 11.1% | 55.9% | 86.0% | 76.0% | 51.1% | 56.0% |
| Mud | 2.9% | 0.7% | 0.3% | 0.0% | 0.0% | 0.8% |
| Bamboo | 7.2% | 1.6% | 0.3% | 0.0% | 0.0% | 1.8% |
| Other | 59.0% | 34.3% | 7.8% | 11.0% | 8.4% | 24.1% |
| **Flooring Materials (% HHs):** | | | | | | |
| Parquet | 0.0% | 0.3% | 0.3% | 0.0% | 0.0% | 0.1% |
| Brick | 0.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.1% |
| Linoleum, vinyl, asphalt | 1.0% | 11.1% | 16.7% | 21.4% | 12.9% | 12.6% |
| Concrete | 0.6% | 1.3% | 0.0% | 0.6% | 0.0% | 0.5% |
| Soil, sand | 89.0% | 32.4% | 3.3% | 1.0% | 1.9% | 25.6% |
| Cement | 6.8% | 46.1% | 73.9% | 62.5% | 43.2% | 46.4% |
| Tiles | 0.0% | 0.3% | 1.3% | 2.9% | 28.7% | 6.7% |
| Cow dung | 1.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% |
| Carpet | 0.0% | 0.0% | 0.3% | 0.6% | 1.3% | 0.5% |
| Other | 1.6% | 8.2% | 4.2% | 11.0% | 11.9% | 7.4% |

**TABLE 6:** DWELLING ENERGY SOURCE

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Dwelling Lighting Source (% HHs):** | | | | | | |
| No lighting | 0.0% | 0.0% | 0.6% | 0.0% | 0.0% | 0.1% |
| Electricity | 0.3% | 3.2% | 7.7% | 79.4% | 98.4% | 37.8% |
| Gas | 0.0% | 0.0% | 0.0% | 0.0% | 1.0% | 0.2% |
| Kerosene | 1.0% | 0.3% | 0.6% | 0.0% | 0.0% | 0.4% |
| Coal | 0.0% | 0.0% | 0.0% | 0.3% | 0.3% | 0.1% |
| Wood | 3.9% | 1.6% | 1.3% | 0.3% | 0.0% | 1.4% |
| Peat, manure | 0.0% | 0.6% | 0.3% | 0.0% | 0.0% | 0.2% |
| Candles | 5.8% | 15.2% | 19.7% | 7.7% | 0.0% | 9.7% |
| Battery | 47.1% | 36.1% | 32.6% | 2.6% | 0.3% | 23.7% |
| Other | 41.9% | 42.9% | 37.1% | 9.7% | 0.0% | 26.3% |
| **Dwelling Cooking Fuel (% HHs):** | | | | | | |
| Electricity | 0.0% | 0.0% | 0.0% | 0.0% | 2.3% | 0.5% |
| Gas | 0.0% | 0.0% | 1.9% | 13.5% | 66.8% | 16.5% |
| Kerosene | 0.0% | 0.3% | 0.0% | 0.3% | 0.0% | 0.1% |
| Coal | 0.3% | 1.9% | 2.6% | 11.6% | 14.5% | 6.2% |
| Wood | 97.1% | 95.2% | 90.6% | 70.0% | 16.1% | 73.8% |
| Peat, manure | 0.6% | 1.0% | 2.9% | 1.9% | 0.0% | 1.3% |
| Candles | 0.3% | 0.3% | 0.3% | 0.0% | 0.0% | 0.2% |
| Battery | 0.6% | 0.0% | 0.6% | 0.0% | 0.0% | 0.3% |
| Other | 1.0% | 1.3% | 1.0% | 2.6% | 0.3% | 1.2% |

**TABLE 7:** INDIVIDUAL'S WORK ACTIVITY AND WAGES

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Employment status:** | | | | | | |
| HH head is employed outside household (% HH heads) | 88.4% | 86.1% | 84.7% | 81.4% | 72.3% | 82.6% |
| Other HH member is employed outside household (% other HH members) | 47.6% | 48.4% | 52.6% | 45.4% | 43.0% | 47.1% |
| HH head helps in family business (% HH heads) | 71.4% | 56.1% | 46.8% | 48.3% | 38.1% | 49.1% |
| Other HH member helps in family business (% other HH members) | 74.8% | 73.6% | 73.5% | 68.0% | 74.6% | 72.7% |
| **Monthly Salary:** | | | | | | |
| Primary job salary (in CFA) | 20,098 | 35,844 | 31,876 | 56,905 | 63,772 | 42,369 |
| Total salary for primary and secondary jobs (in CFA) | 23,440 | 39,661 | 36,709 | 60,158 | 67,383 | 45,549 |
| **Total Hours Worked in a Week:** | | | | | | |
| Hours spent on primary job | 41.3 | 42.2 | 8.1 | 44.4 | 49.2 | 43.5 |
| Hours spent on secondary jobs | 11.8 | 8.1 | 48.6 | 3.7 | 1.7 | 6.7 |
| Total hours spent on work | 53.1 | 50.4 | 48.6 | 48.1 | 50.9 | 50.2 |

**TABLE 8A:** SELF-REPORTED HANDWASHING BEHAVIOR WITH SOAP 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) | 94.0% | 96.5% | 98.2% | 98.8% | 99.5% | 97.4% |
| **Washed Hands with Soap at Least Once in Previous 24 Hours During the Following Events (% caregivers):** | | | | | | |
| During at least one critical juncture (% caregivers) | 25.7% | 29.9% | 35.1% | 45.2% | 49.0% | 37.0% |
| Using the toilet (% caregivers) | 8.8% | 15.2% | 19.0% | 28.9% | 29.9% | 20.4% |
| Cleaning children's bottom (% caregivers) | 7.8% | 10.5% | 13.8% | 18.1% | 18.7% | 13.8% |
| Cooking or preparing food (% caregivers) | 12.3% | 12.0% | 11.5% | 9.6% | 16.9% | 12.4% |
| Feeding children (% caregivers) | 2.0% | 4.0% | 3.0% | 5.4% | 9.6% | 4.8% |

Table 7 presents information on the employment status and wages for any individuals over 15 years old. On average, 82.6 percent of the household heads were employed in the week previous to the interview, but only 47.1 percent of the other household members older than 15 years were employed. Poorer household heads reported higher employment activities outside household (88.4 percent). The average monthly salary for the primary job is 42,369 CFA (equivalent to US$90), and the total monthly salary for both primary and secondary jobs is 45,549 CFA (equivalent to US$97).[21] The total number of hours worked in a week job is 50.

**An anumerator conducts a survey with the head of the household.**

[21] Primary job is an individual's main employment occupation. A secondary job is an additional remunerated activity that some individuals held to supplement their main employment or primary job.

## 3.2 Handwashing Behavior

**Key Findings:**

- Poorer households are twice as likely to report handwashing with soap at critical times than wealthier households.
- Poorer households are less likely to wash hands with soap after using the toilet or cleaning children's bottoms than wealthier households.
- Observed handwashing behavior with soap at critical junctures is three times lower than self-reported rates.
- A designated place for handwashing stocked with soap and water is observed only in a third of the households. Among poor households in particular, access to a handwashing station with soap and water can be observed in 12 percent of the households.
- Caregiver's fingernails, palms and finger pads seem to have a cleaner appearance among wealthier households.

The 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 main ways: self-reported handwashing at critical times 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.

**TABLE 8B:** SELF-REPORTED HANDWASHING BEHAVIOR WITH SOAP BY REGION (PREVIOUS 24 HOURS)

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| Washed hands with soap at least once in previous 24 hours (% caregivers) | 91.2% | 98.6% | 95.5% | 99.3% | 97.4% |
| **Washed Hands with Soap at Least Once in Previous 24 Hours during the Following Events (% caregivers):** | | | | | |
| During at least one critical juncture (% caregivers) | 30.3% | 37.3% | 41.8% | 37.7% | 37.0% |
| Using the toilet (% caregivers) | 14.3% | 20.0% | 21.8% | 22.7% | 20.4% |
| Cleaning children's bottom (% caregivers) | 11.9% | 9.7% | 22.6% | 15.6% | 13.8% |
| Cooking or preparing food (% caregivers) | 9.2% | 15.8% | 11.9% | 10.5% | 12.4% |
| Feeding children (% caregivers) | 4.8% | 4.6% | 8.6% | 3.7% | 4.8% |

These measures serve as proxy indicators of handwashing with soap behavior in this study, since the actual behavior and when it takes place is only observed through structured observations in a subsample of 110 households.

As shown in Table 8A, nearly all caregivers (97.4 percent), 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 much lower. When prompted for the occasions over the past 24 hours during which they washed their hands with soap, less than a quarter reported washing hands with soap at times of fecal contact (20.4 percent during toilet use and 13.8 percent cleaning children's bottoms). Regarding food handling, 12.4 percent of caregivers reported handwashing with soap at times of cooking or food preparation, and fewer than 5 percent did so before feeding a child. Overall, only 37 percent of the caregivers reported having washed their hands with soap at a critical juncture in the previous day, and on average, self-reported handwashing with soap was higher among wealthier than poorer households for most critical junctures.

Table 8B shows the same figures disaggregated by region. Among all regions, Fatick seems to have the lowest rates of handwashing, while Saint Louis seems to have the highest, although this is not the case for all critical junctures. For instance, 14.3 percent of caregivers living in Fatick reported handwashing with soap during toilet use, compared to 22.7 percent on in Thiès. Similarly, 11.9 percent of caregivers in Fatick reported handwashing with soap while cleaning children's bottoms, compared to 22.6 percent in Saint Louis. However, the figure for that specific juncture was even lower for Kaolack; thus, there is no way to conclude a clear cut-pattern from the regional analysis.

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 region 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 9A and 9B present findings about to access to a place for washing hands with water and soap present anywhere in the home or yard. Despite the fact that practically all caregivers reported to wash hands with soap at least once since the previous day, a designated place for handwashing with both soap and water[23] was present within the home or yard in only a third of the households (32.3 percent). Disaggregation of these findings by wealth quintiles shows that the number of households with a place for handwashing with soap and water is much higher among the wealthiest households (56.1 percent) than among the poorest (12.3 percent). This finding points to a positive association between wealth and the 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 importance of targeting the

[23] The variable 'Designated Place for Handwashing with Soap and Water' responds to the number of households with an observed place for handwashing stocked with soap AND water within the dwelling and/or yard premises.

**TABLE 9A:** OBSERVATION OF HANDWASHING STATION WITH SOAP AND WATER BY WEALTH QUINTILE

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Observed HW station with soap and water (%HHs) | 12.3% | 18.4% | 33.2% | 41.3% | 56.1% | 32.3% |
| **Location of HW Station (% HHs):** | | | | | | |
| Inside toilet or kitchen facility | 4.2% | 3.2% | 8.7% | 12.3% | 12.6% | 8.2% |
| In yard within 3 meters of toilet or kitchen facility | 4.5% | 3.2% | 13.5% | 21.0% | 30.0% | 14.5% |
| In yard between 3 and 10 meters of toilet or kitchen facility | 2.6% | 7.4% | 7.7% | 6.8% | 9.7% | 6.8% |
| In yard more than 10 meters from toilet or kitchen facility | 1.0% | 4.5% | 3.2% | 1.3% | 3.9% | 2.8% |

project to the poor in order to achieve the greatest impacts. The findings by region are likewise instructive, where access to a place for handwashing is lowest in Kaolack (26.4 percent) and highest in Saint Louis (38.1 percent).

The proximity of a place for washing hands with soap 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.[24] In the households sampled, the place for handwashing with soap and water was located in the yard in 14.5 percent of the households, and inside the toilet or kitchen facility in only 8.2 percent of households. The wealthiest households have the place for handwashing relatively closer to the toilet and/or kitchen than the poorest households. Thus, in 4.5 percent of the poorest households the handwashing place is within 3 meters of the kitchen or toilet facility compared to 30 percent in those households with the highest wealth.

Further information was collected among those households with a designated place for handwashing regarding its location, 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 as an alternative cleansing agent. 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 10 summarizes findings for the principal place used by the household members to wash hands after using to the toilet. Over two-fifths (42.2 percent) of the households do not have a specific place for handwashing. Among those who have, there are two main types of handwashing devices, a

**TABLE 9B:** OBSERVATION OF PLACE FOR HANDWASHING WITH SOAP AND WATER BY REGION

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| Observed place for handwashing with soap and water (% HH): | 34.2% | 26.4% | 38.1% | 34.4% | 32.3% |
| **Location of Place for Handwashing (% HH):** | | | | | |
| Inside toilet facility | 8.8% | 8.3% | 8.6% | 7.8% | 8.2% |
| In yard within 3 meters of toilet facility | 8.3% | 13.6% | 20.0% | 15.7% | 14.5% |
| In yard between 3 and 10 meters of toilet facility | 10.0% | 3.9% | 8.1% | 7.6% | 6.8% |
| In yard more than 10 meters from toilet facility | 7.1% | 0.6% | 1.4% | 3.4% | 2.8% |

[24] Ram 2010.

**TABLE 10:** OBSERVATION OF HANDWASHING FACILITIES (AFTER USING THE TOILET)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Location of Handwashing Facilities (% HHs):** | | | | | | |
| Inside toilet facility | 12.8% | 12.2% | 25.1% | 28.3% | 34.6% | 23.3% |
| Inside cooking place | 1.3% | 0.8% | 0.8% | 1.5% | 2.0% | 1.3% |
| Less than 3 meters from toilet facility | 8.1% | 14.7% | 28.2% | 30.9% | 31.9% | 23.5% |
| Between 3 and 10 meters from toilet facility | 2.6% | 5.9% | 4.6% | 9.2% | 11.5% | 7.0% |
| More than 10 meters from toilet facility | 3.4% | 5.0% | 3.1% | 0.4% | 1.0% | 2.5% |
| No specific place | 71.8% | 60.5% | 38.2% | 29.8% | 19.0% | 42.2% |
| **Type of Handwashing Facilities (% HHs):** | | | | | | |
| Tap, faucet | 0.0% | 0.0% | 1.9% | 6.3% | 25.1% | 10.0% |
| Tippy Tap | 0.0% | 0.0% | 0.6% | 0.0% | 0.8% | 0.4% |
| Basin, bucket | 42.4% | 33.7% | 35.4% | 35.9% | 27.6% | 33.5% |
| Container from which water is poured | 37.9% | 33.7% | 41.0% | 43.8% | 37.7% | 39.5% |
| Observation not possible | 6.1% | 5.4% | 7.5% | 1.6% | 1.3% | 3.6% |
| Other | 13.6% | 27.2% | 13.7% | 12.5% | 7.5% | 13.1% |
| Water is available at hand-washing facility (% HHs) | 62.5% | 62.2% | 71.3% | 74.3% | 85.0% | 74.6% |
| **Soaps Available at Handwashing Facility (% HHs):** | | | | | | |
| Bar soap | 39.4% | 34.8% | 45.6% | 53.9% | 60.3% | 50.5% |
| Liquid/dishwashing soap | 0.0% | 1.1% | 1.3% | 2.1% | 2.5% | 1.7% |
| Powder/laundry soap/ detergent | 7.6% | 17.4% | 11.9% | 11.5% | 11.3% | 11.9% |
| No soap observed | 31.8% | 37.0% | 28.7% | 30.9% | 23.8% | 29.0% |
| Ash, mud at handwashing facility (% HH) | 0.0% | 0.0% | 1.6% | 0.0% | 0.0% | 0.4% |
| No cleansing agents at HW station (no soap, nor ash, nor mud observed) (% HHs) | 24.2% | 34.8% | 25.5% | 28.3% | 23.4% | 26.6% |

basin or bucket (33.5 percent), and a container from which water is poured (39.5 percent). In almost three-quarters of the households, water was observed at the place for handwashing. The most frequently observed types of soaps in the handwashing place used after going to toilet were bar soap (50.5 percent), followed by powder, detergent or laundry soap (11.9 percent). Cleansing agents other than soap were practically unobserved in the sampled households (ash and mud for handwashing purposes were only observed in 0.4 percent of the households).

Table 11 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 37.2 percent of households reported that family members usually use a different place for washing hands at these times than that used

**TABLE 11:** OBSERVATION OF HANDWASHING FACILITY (WHEN PREPARING FOOD OR FEEDING A CHILD)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Additional handwashing facility different from table 11 (% HHs): | 21.0% | 32.3% | 39.4% | 40.3% | 52.9% | 37.2% |
| **Location of Handwashing Facility (% HHs):** | | | | | | |
| Inside kitchen facility | 0.4% | 0.0% | 0.7% | 0.8% | 1.9% | 0.8% |
| Inside cooking place | 3.1% | 5.0% | 5.9% | 9.8% | 7.2% | 6.2% |
| Less than 3 meters from kitchen facility | 8.5% | 10.9% | 18.2% | 23.8% | 34.6% | 19.3% |
| Between 3 and 10 meters from kitchen facility | 10.9% | 19.0% | 14.9% | 14.7% | 11.0% | 14.1% |
| More than 10 meters from kitchen facility | 5.4% | 6.6% | 8.6% | 4.2% | 9.5% | 6.9% |
| No specific place | 71.7% | 58.5% | 51.7% | 46.8% | 35.7% | 52.8% |
| **Type of Handwashing Facility (% HHs):** | | | | | | |
| Tap, faucet | 0.0% | 0.0% | 0.0% | 2.8% | 10.1% | 3.4% |
| Tippy Tap | 0.0% | 0.0% | 0.8% | 0.7% | 0.0% | 0.3% |
| Basin, bucket | 75.3% | 76.6% | 71.0% | 63.1% | 60.4% | 67.8% |
| Container from which water is poured | 15.1% | 12.1% | 16.0% | 17.7% | 20.7% | 16.9% |
| Other | 2.7% | 8.4% | 7.6% | 12.8% | 8.3% | 8.5% |
| Water is available at handwashing station (% HHs) | 61.2% | 77.0% | 66.4% | 74.8% | 65.2% | 69.2% |
| **Soaps Available at Handwashing Facility (% HHs):** | | | | | | |
| Bar soap | 20.0% | 30.0% | 34.7% | 47.2% | 46.6% | 38.3% |
| Liquid/dishwashing soap | 0.0% | 1.0% | 1.7% | 0.0% | 0.0% | 0.5% |
| Powder/laundry soap/detergent | 16.9% | 18.0% | 23.1% | 33.6% | 35.0% | 27.2% |
| No soap observed | 38.5% | 38.0% | 30.6% | 25.6% | 29.4% | 31.4% |
| Ash, mud at handwashing facility (% HHs) | 0.0% | 0.0% | 0.0% | 0.0% | 1.8% | 0.4% |
| No cleansing agents at handwashing facility (no soap, nor ash, nor mud observed) (% HHs) | 26.6% | 34.5% | 26.8% | 25.3% | 24.3% | 27.1% |

after going to the toilet. If the respondent indicated the same place for washing hands at all critical times, the results were reported in Table 10. The findings show that only 6.2 percent of the handwashing places are located inside the kitchen or cooking facility, 19.3 percent in an area located within three meters from the cooking facility, 14.1 percent in a yard between three and 10 meters away from the cooking facility and 6.9 percent in a place located more than 10 meters away from the cooking facility. The observations of these facilities reveal that the most common device is a basin or bucket (67.8 percent). The second most used device is a container from which water is poured (16.9 percent), and only households in the two highest quintiles use a tap or faucet. In 69.2 percent of the households water was observed at the place for handwashing. Regarding the availability of soap, the most observed was bar soap (38.3 percent), followed by powder or laundry soap and detergent (27.2 percent). The usage of soap increases with wealth for all types of soap. Cleansing agents other than soap were practically unobserved (ash or mud observed in 0.4 percent of the households).

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 finger pads of the caretaker and recorded their appearance on a scale of visibly dirty, unclean appearance, and clean appearance. Table 12A summarizes these findings. On average, in 83 percent of the cases, caregiver's palms appeared to be clean. This figure was lower for the households in the bottom wealth quintile (74.1 percent) and considerably

higher for those in the top wealth quintile (95.6 percent). Similarly, the wealthiest households appear to have cleaner fingernails and finger pads (83.6 percent and 94.6 percent respectively) than the poorest ones (66.3 percent and 72.7 percent). The regional analysis shows that findings for cleanliness of caregiver's finger palms and finger pads are quite homogenous among regions, while cleanliness of fingernails presents more variation. The results are shown in Table 12B.

**TABLE 12A:** OBSERVATIONS OF CAREGIVERS HANDS BY WEALTH QUINTILE

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Caregiver's Fingernails Appear to Have:** | | | | | | |
| Visible dirt | 10.8% | 16.8% | 12.7% | 6.7% | 4.1% | 10.3% |
| Unclean appearance | 20.9% | 18.1% | 18.9% | 18.1% | 10.0% | 17.3% |
| Clean appearance | 66.3% | 64.4% | 66.9% | 73.3% | 83.6% | 70.8% |
| Observation not possible | 2.0% | 0.7% | 1.2% | 1.9% | 2.3% | 1.6% |
| **Caregiver's Palms Appear to Have:** | | | | | | |
| Visible dirt | 3.7% | 9.4% | 3.7% | 1.2% | 0.3% | 3.6% |
| Unclean appearance | 20.4% | 14.6% | 13.7% | 8.8% | 2.8% | 12.1% |
| Clean appearance | 74.1% | 75.2% | 81.4% | 88.8% | 95.6% | 83.0% |
| Observation not possible | 1.7% | 0.7% | 1.2% | 1.6% | 1.3% | 1.3% |
| **Caregiver's Finger Pads Appear to Have:** | | | | | | |
| Visible dirt | 4.4% | 9.2% | 4.2% | 1.2% | 0.3% | 3.8% |
| Unclean appearance | 20.9% | 14.9% | 13.2% | 10.7% | 3.8% | 12.8% |
| Clean appearance | 72.7% | 75.2% | 81.4% | 86.5% | 94.6% | 82.0% |
| Observation not possible | 1.7% | 0.7% | 1.2% | 1.6% | 1.3% | 1.3% |

**TABLE 12B:** OBSERVATIONS OF CAREGIVERS HANDS BY REGION

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| **Caregiver's Fingernails Appear to Have (% caregivers):** | | | | | |
| Visible dirt | 7.4% | 10.1% | 20.6% | 8.1% | 10.3% |
| Unclean appearance | 26.1% | 14.5% | 10.5% | 18.7% | 17.3% |
| Clean appearance | 64.9% | 73.3% | 66.4% | 72.1% | 70.8% |
| Observation not possible | 1.3% | 2.1% | 2.4% | 1.1% | 1.6% |
| **Caregiver's Palms Appear to Have (% caregivers):** | | | | | |
| Visible dirt | 3.7% | 4.0% | 3.2% | 3.4% | 3.6% |
| Unclean appearance | 13.4% | 14.5% | 10.1% | 10.0% | 12.1% |
| Clean appearance | 82.9% | 79.3% | 85.0% | 85.9% | 83.0% |
| Observation not possible | 0.0% | 2.2% | 1.6% | 0.7% | 1.2% |
| **Caregiver's Finger Pads Appear to Have (% caregivers):** | | | | | |
| Visible dirt | 4.7% | 4.5% | 2.8% | 3.2% | 3.8% |
| Unclean appearance | 12.7% | 14.8% | 11.7% | 11.2% | 12.8% |
| Clean appearance | 82.6% | 78.0% | 83.8% | 85.2% | 82.0% |
| Observation not possible | 0.0% | 2.6% | 1.6% | 0.5% | 1.3% |

Handwashing stations are used to demonstrate proper handwashing.

Finally, the survey conducted structured observations of handwashing behavior in a subsample of households. Structured observations of handwashing behavior were collected during a five-hour period, by observing handwashing behavior of the primary caregiver of a child under two years old. Opportunities for handwashing for persons other than the primary caregiver were also noted if the individual came into the line of sight of the observer. During the five-hour period, the observer noted any opportunity for handwashing and whether handwashing occurred during that time, as well as the details of the opportunity: the type of critical event, the cleansing agent used (e.g., bar soap, liquid soap, mud), washing of one or both hands, and method of hand drying. Critical events of interest included fecal contact (going to the toilet, defecating, or after cleaning children's bottom), food preparation, eating, or feeding children.

Structured observations were completed in a total of 109 households. These observations yielded 1136 events of interest summarized in Table 13. There were a total of 93 fecal contact events, 264 eating events, 139 feeding events, 91 food preparation events and 176 water contact events. Overall, handwashing with soap was observed in 10 percent of the events (109 of the 1136 events). When soap use is disaggregated by critical juncture, soap use was observed in 19 percent of the fecal events (18 of the 53 events), 5 percent of eating events (13 of the 264 events), 4 percent of the feeding events (4 of the 139 events) and 4 percent of the food preparation events (4 of the 91 events).

At least one fecal contact event was observed in 49 percent of the households (53 of the 109 households). One or more eating events were observed in 72 percent (79) of the households, feeding events in 73 percent (80) and food preparation events in 57 percent (62). Soap use was observed at least once in 39 percent (43) of the households.

**TABLE 13:** STRUCTURED OBSERVATIONS OF HANDWASHING BEHAVIOR[25]

| | No. of Events Observed (%) | No. of Events Accompanied by Soap Use (%) | No. of HH Observed with at Least One Event (%) | No. of HH in Which Soap Use Was Observed at Least Once (%) |
|---|---|---|---|---|
| | N=1136 | N=1136 | N=109 | N=109 |
| All types | 1136 (100%) | 109 (10%) | 109 (100%) | 43 (39%) |
| Fecal contact[26] | 93 (8%) | 18 (19%) | 53 (49%) | 13 (25%) |
| Before eating | 264 (23%) | 13 (5%) | 79 (72%) | 7 (9%) |
| Before feeding a child | 139 (12%) | 4 (3%) | 80 (73%) | 4 (5%) |
| Before preparing or serving food | 91 (8%) | 4 (4%) | 62 (57%) | 4 (6%) |
| Water contact | 176 (15%) | 6 (3%) | 79 (72%) | 5 (6%) |

[25] Analysis conducted by Pavani Ram.
[26] Fecal contact event includes defecation, toileting of any kind, and cleaning a child who has defecated.

**TABLE 14A:** ACCESS TO IMPROVED WATER SOURCE BY WEALTH QUINTILE

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| HH has improved water source (%HHs) | 36.7% | 54.0% | 75.5% | 88.1% | 93.5% | 69.6% |

**TABLE 14B:** ACCESS TO IMPROVED WATER SOURCE BY REGION

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| HH has improved water source (%HHs) | 57.1% | 63.4% | 72.6% | 78.9% | 69.6% |

## 3.3 Water Source and Sanitation Facilities

**Key Findings:**

- On average, 70 percent of households have access to an improved source of water, but access among poorer households is just over 36 percent.
- The poor rely mainly on unprotected wells for water sources.
- More than half of the poorest households practice open defecation, while the largest majority of non-poor households have access to improved sanitation.
- Access to improved water sources and improved sanitation varies significantly among regions; Fatick seems to be the least privileged of the regions.

The survey investigates household water sources and access to sanitation facilities. Poor-quality water and lack of access to improved sanitation contribute to a serious disease burden including diarrhea, ALRI, and transmission of parasites, among others. Therefore, it is important to collect information about any variables that might affect the project's primary health outcomes of interest.

Questions related to water source were disaggregated by season (rainy versus dry season); however, since almost every household had the same water source during the whole year, results are presented only for the rainy season. Results are summarized in Tables 14A, 14B and 15.

On average, more than two-thirds of the households (69.6 percent) have access to an improved drinking water source[27]. When disaggregated by wealth quintile, there is huge variation among different quintiles; access to improved sanitation increases sharply with wealth. Thus, while the large majority (93.5 percent) of households in the wealthiest quintile have access to improved water sources, only 36.7 percent of the poorest households have access to improved water. Regional analysis also shows variation among regions, although not as large. The regions with the highest percentages of access to improved water sources are Thiès (78.9 percent) and Saint Louis (72.6), while Fatick has the lowest percentage (57.1 percent).

Table 15 presents information regarding the type of water source and whether the source is covered. The three more common types of water sources are: water directly piped into the yard (26.6 percent), piped water from a public tap or standpipe (24.4 percent), and an unprotected dug well (25.8 percent). The type of water source also varies largely among wealth quintiles. Thus, among the wealthiest quintiles over three-quarters of the household have access to water piped directly into the yard (51.0 percent) or the dwelling (27.1 percent), while none of the poorest households have access to a piped-in water source. By contrast, over three-quarters (58.1 percent) of the poorest households use an unprotected dug well, and around 7.5 percent use a protected dug well, while only 1.3 percent of the wealthiest households use wells. For

[27] The 'Access to Improved Drinking Water Source' variable was created following the definition and recommendations made by the WHO/UNICEF Joint Monitoring Programme (JMP) for Water and Sanitation (http://www.wssinfo/definitions/infrastructure.html).

**TABLE 15:** TYPE OF WATER SOURCE

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **HH Source of Water for Drinking Use (% HHs):** | | | | | | |
| Piped water, into dwelling | 0.6% | 1.3% | 2.6% | 11.0% | 27.1% | 8.5% |
| Piped water, into yard, plot | 2.9% | 10.0% | 23.2% | 45.5% | 51.0% | 26.6% |
| Piped water, public tap, standpipe | 23.1% | 33.3% | 31.0% | 22.3% | 12.3% | 24.4% |
| Tube well, borehole | 0.3% | 0.0% | 0.0% | 0.0% | 0.3% | 0.1% |
| Dug well, protected | 7.5% | 7.1% | 15.2% | 4.5% | 1.3% | 7.1% |
| Dug well, unprotected | 58.1% | 41.4% | 20.0% | 8.1% | 1.6% | 25.8% |
| Spring water, protected | 1.3% | 1.6% | 3.2% | 4.8% | 1.6% | 2.5% |
| Spring water, unprotected | 0.6% | 3.2% | 1.6% | 0.3% | 0.0% | 1.2% |
| Rainwater | 1.0% | 0.6% | 0.3% | 0.0% | 0.0% | 0.4% |
| Water vendor | 0.0% | 0.3% | 0.6% | 2.9% | 3.9% | 1.6% |
| Surface water | 2.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.5% |
| Other | 2.3% | 1.0% | 2.3% | 0.6% | 1.0% | 1.4% |
| **Covered Source (% HHs):** | | | | | | |
| Covered | 14.1% | 8.2% | 34.8% | 46.2% | 37.9% | 21.3% |
| Open | 83.7% | 89.5% | 59.8% | 33.8% | 20.7% | 72.1% |
| Both covered and open | 1.3% | 1.8% | 3.8% | 7.7% | 6.9% | 2.9% |
| Don't know | 0.9% | 0.6% | 1.5% | 12.3% | 34.5% | 3.7% |
| **Water collection (% HHs):** | | | | | | |
| Adult woman | 95.9% | 94.9% | 94.7% | 86.2% | 76.2% | 92.8% |
| Adult man | 2.0% | 2.2% | 3.1% | 8.5% | 19.0% | 4.3% |
| Girl < 15 yrs | 1.7% | 2.2% | 1.3% | 3.8% | 1.6% | 2.0% |
| Boy < 15 yrs | 0.3% | 0.7% | 0.9% | 1.5% | 0.0% | 0.7% |
| Satisfied with quantity of water (%HHs) | 61.2% | 56.4% | 65.1% | 79.9% | 88.0% | 70.2% |
| Household Pay for the water (% HHs) | 38.6% | 51.1% | 66.1% | 86.0% | 96.4% | 67.7% |

the majority (72.1 percent) of the households the water source is covered, while in 21.3 percent of the households the water sources are uncovered. Covered water sources are more common among wealthier households (37.9 percent) than among the poorer ones (14.1 percent). In the majority of the households (92.8 percent) an adult female is in charge of collecting water from the source. The task is performed by an adult male only in 4.3 percent of the households and by a child under 15 years old in 2.7 percent. On average, two-thirds of the households pay for the water and 70.2 percent of the households are satisfied with the quantity of drinking water.

The following tables present information about the sanitation facilities observed in the surveyed households. Tables 16A and 16B show that almost 70 percent of the households have access to improved sanitation facilities[28]. As with the patterns observed with water sources, when disaggregated by wealth, access to improved sanitation varies considerably among quintiles. In the poorest quintile, almost a quarter (23.5 percent) of the households have access to improved sanitation. In the second quintile, access increases to 48.1 percent of the households, and in the third quintile more than three quarters of the households have improved sanitation facilities. Among the 4th and 5th quintiles the

[28] The 'Access to Improved Sanitation Facility' variable was created following the definition and recommendations made by the WHO/UNICEF Joint Monitoring Programme (JMP) for Water and Sanitation (http://www.wssinfo/definitions/infrastructure.html).

**TABLE 16A:** ACCESS TO IMPROVED SANITATION BY WEALTH QUINTILE AND REGION

| | Wealth Quintile | | | | | Total |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | |
| HH has improved sanitation (%HHs) | 23.5% | 48.1% | 79.6% | 97.1% | 98.7% | 69.4% |

**TABLE 16B:** ACCESS TO IMPROVED SANITATION BY WEALTH QUINTILE AND REGION

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| HH has improved sanitation (%HHs) | 57.3% | 65.1% | 77.0% | 75.3% | 69.4% |

large majority of the households have improved sanitation facilities (97.1 percent and 98.7 percent, respectively). The regional analysis summarized in Table 16B also shows variation per region. For instance, in Fatick just over half (57.3 percent) of the households have access to improved sanitation compared to more than three quarters of the households in Saint Louis (77 percent) or in Thiès (75.3 percent).

When looking at the types of sanitation facilities (Table 17) the most striking finding is that on average, more than a fifth of the households do not have sanitation facilities of any type. As expected, this is not the case for the wealthier households, and nearly none of them lack a sanitation facility (just 0.9 percent of the households in the 4th and 5th quintiles have no facilities). However, among the poorest households nearly two thirds (57.7 percent) have no sanitation facility of any type and therefore have to defecate in the open. The two most common types of facilities are flush toilet piped to a septic tank (37.3 percent), followed by pit latrine without slab (17.8 percent). As expected, flush toilets were almost entirely observed in wealthy households (flush toilets were observed in 74.5 percent of the wealthiest households but in barely none of the poorest), while pit latrines were largely observed among poor households (just 7.4 percent of the households in the 5th wealth quintile had a pit latrine with no slab, while the figures for the three lowest wealth quintiles were between 18 to 30 percent). Most of these facilities are located in the household yard (42.3 percent), inside the household (27.1 percent) or have no designated area (16.7 percent). On average, 93.4 percent of the households have private facilities and only 6.6 percent use public facilities.

Finally, the survey collected information about other sanitary conditions such as presence of visible feces around the household and waste disposal practices. These findings are summarized in Table 18. In about half of the households (49.6 percent) no visible feces were observed inside or around the household; this percentage was much higher among the wealthiest households (84.4 percent) than in the poorest families (35.6 percent). However, 10 or more signs of visible feces were observed in nearly a third of the households. Again, more feces were observed in the poorest households (38.8 percent) than in wealthiest ones (9.7 percent). Regarding waste disposal, the most common practice for disposal of child feces among the poorest households was to throw the feces into the bushes or on the ground (45.8 percent), into a toilet or latrine (22.9 percent), or directly into the garbage (14.5 percent). Among the wealthiest households, the most common practice was to dispose of child feces into the toilet or latrine (77.4 percent), followed by disposal or into a pit or hole in the ground (15.8 percent).

Many households rely on wells for water supply.

**TABLE 17:** HOUSEHOLD MAIN SANITATION FACILITY CHARACTERISTICS

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **HH Main Sanitation Facility (% HHs):** | | | | | | |
| Flush, to piped sewer system | 0.0% | 0.0% | 0.0% | 1.9% | 10.6% | 2.5% |
| Flush, to septic tank | 0.6% | 12.3% | 35.0% | 64.3% | 74.5% | 37.3% |
| Flush, to pit latrine | 3.2% | 8.4% | 11.0% | 6.2% | 0.6% | 5.9% |
| Flush, to elsewhere | 0.3% | 0.0% | 0.6% | 0.0% | 0.3% | 0.3% |
| Flush, don't know where | 0.0% | 0.0% | 0.0% | 0.0% | 0.6% | 0.1% |
| Ventilated improved pit latrine | 0.6% | 3.6% | 6.1% | 10.4% | 4.8% | 5.1% |
| Pit latrine with slab | 18.4% | 22.7% | 26.5% | 14.0% | 7.4% | 17.8% |
| Composting toilet | 0.6% | 1.0% | 1.0% | 0.3% | 0.0% | 0.6% |
| Pit latrine without slab, open pit | 12.3% | 6.2% | 2.3% | 1.6% | 0.0% | 4.5% |
| Bucket | 0.0% | 0.0% | 0.0% | 0.3% | 0.0% | 0.1% |
| No facilities, Open defecation | 57.7% | 37.0% | 12.3% | 0.6% | 0.3% | 21.6% |
| Other | 6.1% | 8.8% | 5.2% | 0.3% | 0.6% | 4.2% |
| **Location of Main Sanitation Facility (% HHs):** | | | | | | |
| Inside household | 9.8% | 16.9% | 22.8% | 39.2% | 46.9% | 27.1% |
| In household yard | 16.6% | 32.2% | 56.0% | 55.6% | 50.8% | 42.3% |
| Less than 10 minutes walk | 17.3% | 13.7% | 10.4% | 3.9% | 0.6% | 9.2% |
| More than 10 minutes walk | 10.7% | 6.2% | 2.3% | 0.3% | 1.0% | 4.1% |
| No designated area | 44.6% | 30.3% | 7.2% | 1.0% | 0.3% | 16.7% |
| Other | 1.0% | 0.7% | 1.3% | 0.0% | 0.3% | 0.7% |
| **Toilet Facility Public or Private (% HHs):** | | | | | | |
| Public | 3.9% | 10.4% | 7.7% | 6.2% | 5.1% | 6.6% |
| Private | 96.1% | 89.6% | 92.3% | 93.8% | 94.9% | 93.4% |

**TABLE 18:** OTHER CHARACTERISTICS OF HOUSEHOLDS' SANITARY CONDITION

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Visible Feces In/Around HH (% HHs):** | | | | | | |
| 1-5 feces | 18.8% | 11.3% | 12.0% | 7.1% | 2.9% | 10.4% |
| 5-10 feces | 5.8% | 11.3% | 9.4% | 4.2% | 2.9% | 6.7% |
| More than 10 feces | 38.8% | 43.7% | 38.2% | 28.6% | 9.7% | 31.8% |
| Cannot tell | 1.0% | 2.3% | 2.6% | 1.3% | 0.0% | 1.4% |
| None | 35.6% | 31.4% | 37.9% | 58.8% | 84.4% | 49.6% |
| **Disposal of Child Feces (% HHs):** | | | | | | |
| Bushes, ground | 37.1% | 32.9% | 13.9% | 2.3% | 0.3% | 17.3% |
| Pit, hole in the ground | 8.7% | 8.1% | 12.6% | 15.2% | 15.8% | 12.1% |
| Open sewer, drain | 0.3% | 0.0% | 1.0% | 1.6% | 2.3% | 1.0% |
| Toilet, latrine | 23.9% | 43.2% | 63.9% | 77.1% | 77.4% | 57.1% |
| Garbage | 21.6% | 5.8% | 3.2% | 3.9% | 4.5% | 7.8% |
| River | 0.6% | 0.3% | 0.0% | 0.3% | 0.6% | 0.4% |
| Other | 16.8% | 10.6% | 6.5% | 1.0% | 0.3% | 7.0% |

**TABLE 19A:** DIARRHEA AND ALRI PREVALENCE BY SANITARY CONDITIONS (CHILDREN <5)

| | Improved Sanitation | | Improved Water Source | | Place for Handwashing w/ Soap and Water | |
|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No |
| Child had diarrhea symptoms in previous 48 hours (%Children<5) | 7.2% | 5.4% | 6.7% | 6.6% | 6.3% | 6.9% |
| Child had diarrhea symptoms in previous week (%Children<5) | 10.5% | 8.3% | 10.3% | 9.1% | 9.3% | 10.2% |
| Child had diarrhea symptoms in past 14 days (%Children<5) | 11.4% | 9.4% | 11.4% | 9.9% | 9.9% | 11.3% |
| Child had ALRI symptoms in previous 48 hours (%Children<5) | 1.9% | 1.6% | 2.1% | 1.2% | 2.1% | 1.7% |
| Child had ALRI symptoms in previous week (%Children<5) | 2.6% | 2.2% | 2.8% | 1.7% | 3.0% | 2.2% |
| Child had ALRI symptoms in past 14 days (%Children<5) | 2.8% | 2.3% | 3.0% | 1.9% | 3.3% | 2.4% |

## 3.4 Diarrhea, Acute Lower Respiratory Infection and Anemia Prevalence

Key Findings:

- Poorer households are half as likely to report handwashing with soap at critical times as wealthier households.
- One in each 10 children had diarrhea symptoms in the previous 14 days. ALRI symptoms were reported only in 2.3 percent of the households.
- Diarrhea symptoms were lower among those households with access to a place for handwashing with soap and water.
- Diarrhea and ALRI do not seem to be correlated with income; however the findings show considerable regional differences.
- Anemia prevalence is observed in the majority of households, and does not seem to be highly correlated with income.

Households without access to a place for washing hands stocked with soap and water, without access to improved water, or without access to improved sanitation are more likely to lose productive hours due to child illness and have slightly higher percentages of 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. Additionally, hemoglobin concentrations were obtained from children between six months and two years of age to estimate the percentage suffering from anemia prevalence.

Diarrhea prevalence 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 using the symptom data obtained from the child health histories.[29] 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 and ALRI prevalence in the sampled population of children younger than age five is presented in Tables 19. Findings are disaggregated by wealth, region and sanitary conditions. The findings reveal that 6.7 percent of the children presented diarrhea symptoms in the previous 48 hours, 9.9 percent presented symptoms in the past seven days, and 10.9 percent in the past 14 days. These figures are much lower than those reported by the last Demographic Health Survey (DHS) (22 percent for a two-weeks recall); however, it is worth noting a couple points. First, the last DHS survey was conducted in 2005, four years before the WSP survey, and included all the regions in Senegal. As explained in Section 2, regions at risk or with a recent episode of cholera were excluded from the survey, therefore it is reasonable to expect much lower rates of diarrhea prevalence among those regions not affected by cholera. Second, the DHS variable for diarrhea is based on caregivers perception of whether the child has had diarrhea, rather than based on caregiver-reported symptoms, the latter being a more strict measure. Compared to other project countries, diarrhea prevalence for a two-week recall period in Senegal is lower than in Peru (20.4 percent) or India (15.2 percent) and higher

[29] Baqui et al. 1991.

**TABLE 19B:** DIARRHEA AND ALRI TREATMENT BY WEALTH QUINTILE (CHILDREN <5)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Child had diarrhea symptoms in previous 48 hours (%Children<5) | 7.4% | 6.9% | 6.2% | 6.4% | 6.6% | 6.7% |
| Child had diarrhea symptoms in previous week (%Children<5) | 10.1% | 10.6% | 10.0% | 9.9% | 9.0% | 9.9% |
| Child had diarrhea symptoms in past 14 days (%Children<5) | 11.6% | 11.1% | 10.6% | 11.1% | 9.9% | 10.9% |
| Child had ALRI symptoms in previous 48 hours (%Children) | 1.5% | 2.1% | 1.3% | 1.8% | 2.3% | 1.8% |
| Child had ALRI symptoms in previous week (%Children) | 2.1% | 2.8% | 2.0% | 2.4% | 3.2% | 2.5% |
| Child had ALRI symptoms in past 14 days (%Children) | 2.3% | 2.8% | 2.0% | 2.5% | 3.9% | 2.7% |

than in Indonesia (8.4 percent) or Vietnam (1.3 percent).[30] When the results are disaggregated by sanitary condition the findings show that for all the three recall periods, the prevalence of diarrhea is lower in households with access to a place for handwashing with soap and water. Diarrhea prevalence in households with access to improved sanitation and improved water sources appears to be higher than in those households without. While these latter findings may appear counterintuitive, these differences are not statistically different from zero.[31]

When diarrhea prevalence is disaggregated by wealth quintiles there is no strong correlation between the two variables. Although the findings show that prevalence of diarrhea is the highest among those households in the bottom wealth quintile for two of the three recall periods, no clear pattern can be observed among the other wealth quintiles. When disaggregating diarrhea prevalence by regions, diarrhea for all three-recall periods was more than twice as high in Kaolack (3.7 percent, 6 percent and 6.8 percent) than in Fatick (10.2 percent, 14.2 percent and 15.4 percent).

The prevalence of ALRI is lower than diarrhea in our sample: 1.8 percent of children presented ALRI symptoms in the previous 48 hours, 2.5 percent presented symptoms in the past seven days, and 2.7 percent in the past 14 days. ALRI prevalence seems higher among households with access to improved water, improved sanitation and a designated place for handwashing with soap and water compared to those without. ALRI symptoms are also higher among the wealthier quintiles. Regarding regional variation, the highest prevalence is among children living in St. Louis for all three-recall periods, while it is lowest for children living in Fatick. Similarly to the diarrhea figures, some of these findings seem counterintuitive, as one would expect that better sanitary conditions or higher income would result in lower prevalence of ALRI. Differences observed among households by different sanitary condition were tested again and it was found that those differences among households with and without improved sanitation or with and without a place for handwashing stocked with soap and water are statistically not different. Nonetheless, the test for significance shows that differences among households with

**TABLE 19C:** DIARRHEA AND ALRI PREVALENCE BY REGION (CHILDREN <5)

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| Child had diarrhea symptoms in previous 48 hours (%Children<5) | 3.7% | 10.2% | 4.9% | 5.1% | 6.7% |
| Child had diarrhea symptoms in previous week (%Children<5) | 6.0% | 14.2% | 6.4% | 8.5% | 9.9% |
| Child had diarrhea symptoms in past 14 days (%Children<5) | 6.8% | 15.4% | 7.5% | 9.2% | 10.9% |
| Child had ALRI symptoms in previous 48 hours (%Children<5) | 1.0% | 1.9% | 2.6% | 1.7% | 1.8% |
| Child had ALRI symptoms in previous week (%Children<5) | 1.0% | 2.9% | 3.6% | 2.3% | 2.5% |
| Child had ALRI symptoms in past 14 days (%Children<5) | 1.0% | 3.1% | 4.5% | 2.4% | 2.7% |

[30] For more details see the baseline reports for Peru, India, Indonesia and Vietnam.
[31] Significance test shows that the observed differences are not statistically significant at the 5% level.

and without access to improved water are indeed statistically different. A plausible explanation is that households with improved water sources do not treat the water as much as those with unimproved sources. It is expected that the endline data will bring clarification to those unanswered questions.

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 (Table 20). On average, almost half (48.6 percent) of the caregivers with children presenting either diarrhea or ALRI symptoms in the previous 48 hours did not seek medical advice, while almost a third (29.3 percent) went to visit the doctor. When medical advice was requested, the most common prescribed treatment was pill or syrup for both intestinal (40.7 percent) and respiratory symptoms (45.3 percent) and traditional remedies (12.1 percent for both intestinal and respiratory symptoms), and most caregivers paid for the treatment (21.2 percent did not pay for intestinal treatment and 15.2 percent did not pay for respiratory treatment).

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 21, reveal that in an average of 15.8 percent of households, one or more primary caretakers lost time due to the illness of a

**TABLE 20:** DIARRHEA AND ALRI TREATMENT BY WEALTH QUINTILE (CHILDREN <5)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Caregiver Did Seek Medical Advice (% Children <5):** | | | | | | |
| Did not seek any medical assistance | 56.3% | 52.5% | 34.0% | 44.6% | 54.2% | 48.6% |
| Day visit to doctor | 21.9% | 15.3% | 32.1% | 44.6% | 35.4% | 29.3% |
| Hospitalization | 1.6% | 0.0% | 1.9% | 0.0% | 0.0% | 0.7% |
| Pharmacist | 0.0% | 3.4% | 3.8% | 3.6% | 4.2% | 2.9% |
| Traditional healer | 4.7% | 8.5% | 9.4% | 3.6% | 0.0% | 5.4% |
| Herbalist | 1.6% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% |
| **Type of Intestinal Treatment Given:** | | | | | | |
| No treatment | 37.5% | 47.5% | 26.4% | 41.1% | 45.8% | 39.6% |
| Pill or Syrup | 45.3% | 25.4% | 50.9% | 42.9% | 39.6% | 40.7% |
| Injection | 1.6% | 1.7% | 1.9% | 3.6% | 0.0% | 1.8% |
| Intravenous | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Traditional Remedies | 17.2% | 17.0% | 9.4% | 5.4% | 10.4% | 12.1% |
| Oral rehydration solution | 4.7% | 0.0% | 5.7% | 3.6% | 2.1% | 3.2% |
| Homemade sugar/salt water | 3.1% | 0.0% | 1.9% | 3.6% | 2.1% | 2.1% |
| Other | 4.7% | 5.1% | 1.9% | 3.6% | 0.0% | 3.2% |
| Did not pay for the intestinal treatment (% Caregivers) | 29.2% | 27.5% | 17.5% | 14.0% | 7.3% | 19.5% |
| **Type of Respiratory Treatment Given:** | | | | | | |
| No treatment | 46.2% | 50.0% | 18.2% | 18.8% | 29.4% | 33.3% |
| Pill or Syrup | 38.5% | 27.8% | 36.4% | 56.3% | 64.7% | 45.3% |
| Injection | 0.0% | 0.0% | 9.1% | 0.0% | 5.9% | 2.7% |
| Intravenous | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Traditional Remedies | 7.7% | 17.0% | 9.4% | 5.4% | 10.4% | 12.1% |
| Other | 7.7% | 16.7% | 18.2% | 0.0% | 11.8% | 10.7% |
| Did not pay for the respiratory treatment (% Caregivers) | 19.2% | 18.1% | 14.7% | 15.9% | 7.3% | 15.2% |

**TABLE 21:** HOUSEHOLD WITH LOST HOURS DUE TO CHILD ILLNESS

| | % Caregivers |
|---|---|
| **By Sanitary Conditions:** | |
| Improved sanitation | 15.2% |
| Unimproved sanitation | 16.1% |
| Improved water source | 12.1% |
| Unimproved water source | 17.5% |
| Place for Handwashing w/ soap and water | 12.7% |
| No Place for handwashing w/ soap and water | 22.4% |
| **By Wealth Quintile:** | |
| 1st | 15.2% |
| 2nd | 14.5% |
| 3rd | 12.3% |
| 4th | 16.5% |
| 5th | 20.6% |
| **By Region:** | |
| Fatick | 10.4% |
| Kaolack | 25.0% |
| St. Louis | 3.8% |
| Thiès | 14.3% |
| **Overall** | **15.8%** |

**TABLE 22:** ANEMIA PREVALENCE (CHILDREN <2)

| (Hb < 110 g/L) | % Children <2 |
|---|---|
| **By Sanitary Conditions:** | |
| Improved sanitation | 90.3% |
| Unimproved sanitation | 91.7% |
| Improved water source | 90.0% |
| Unimproved water source | 92.4% |
| Place for Handwashing w/ soap and water | 87.7% |
| No Place for handwashing w/ soap and water | 92.1% |
| **By Wealth Quintile:** | |
| 1st | 94.3% |
| 2nd | 92.3% |
| 3rd | 88.3% |
| 4th | 91.6% |
| 5th | 87.4% |
| **By Region:** | |
| Fatick | 91.2% |
| Kaolack | 93.5% |
| St. Louis | 91.6% |
| Thiès | 87.7% |
| **Overall** | **90.7%** |

child over the past 14 days. This percentage increases for households with no designated place for handwashing with soap and water, unimproved water sources, or unimproved sanitation. This percentage also increases with wealth levels. Larger variation is observed at the regional level; for instance a quarter (25 percent) of the households living in Kaolack reported having lost hours due to child's illness, compared to only 3.8 percent in Saint Louis. A plausible explanation to such large variation is that Kaolack had the highest rates of diarrhea prevalence; however, Saint Louis presented the highest levels of ALRI prevalence.

A child is tested for anemia.

Findings for anemia prevalence are summarized in Table 22. A large majority (90.7 percent) of the samples taken indicated the presence of anemia. This proportion is lower for households with a designated place for handwashing (87.7 percent) and larger for those without (92.4 percent). The percentage is also a bit lower among children living in households with access to improved water sources and improved sanitation. Anemia prevalence does not seem to be correlated with wealth, as the lowest rates are observed among the 3rd and 5th quintiles, and the highest rates among the 1st, 2nd and 4th quintiles. Regarding different levels by regions, the percentage of anemia prevalence is also highest among children living in Kaolack (93.5 perecnt) and lowest among children living in Thiès (87.7 percent).

## 3.5 Child Care Environment

Key Findings:

- Most children under two years of age continue to be breastfed. The average number of months a child is breastfed is around 16.
- The use of instant formula is not a common practice and is more likely to be used among wealthier households.
- Children in poorer households are less likely to receive nutritional supplements such as vitamin A or iron pills.

It is largely recognized that characteristics of the caregiver and the quality of care a child receives have huge impacts on young children's health, nutritional status, and development.[32] Moreover, some of these factors have been found to be significant predictors of child outcomes beyond variation due to socio-economic and education variables. To enable the more carefully deliniation of the potential effects of the interventions on child health, growth, and development, information was gathered on feeding practices, caregiving behavior, and caregiver well-being.

Table 23 summarizes breastfeeding habits within the interviewed households. The average breastfeeding time is 16.4 months, and 94.8 percent of children received colostrum[33] during the first three days after childbirth. Although it is recommended that mothers feed only with breast milk during the first six months of life, 69.5 percent of mothers also fed their babies liquids other than colostrum or breast milk during the first three days of life.

The survey also includes a section on child diet. Specifically, caregivers of infants under the age of two were asked about liquids and food given to their children in the day previous to the interview. Results are reported in Table 24.

**TABLE 23:** CHILD BREASTFEEDING (CHILDREN <2)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Average months breastfeeding | 16.8 | 16.1 | 16.3 | 17.1 | 15.8 | 16.4 |
| Still breastfeeding (% children) | 88.1% | 87.1% | 83.5% | 82.6% | 76.5% | 83.6% |
| Colostrum given during first three days (% children) | 91.7% | 94.2% | 96.4% | 94.8% | 97.1% | 94.8% |
| Liquid given during first three days, other than colostrum or breast milk (% children) | 72.2% | 65.6% | 72.5% | 68.4% | 68.8% | 69.5% |
| **Liquid Other Than Breast Given During First Three Days (% Children):** | | | | | | |
| Instant formula | 5.0% | 4.4% | 1.0% | 2.7% | 4.6% | 3.5% |
| Milk other than breast | 9.7% | 13.5% | 10.1% | 5.0% | 6.4% | 8.9% |
| Plain water | 23.3% | 24.4% | 23.4% | 8.7% | 8.5% | 17.7% |
| Sugar, glucose water | 7.4% | 8.8% | 4.0% | 6.0% | 5.3% | 6.3% |
| Gripe water | 1.7% | 3.3% | 1.3% | 1.0% | 0.4% | 1.5% |
| Sugar-salt solution | 0.3% | 0.4% | 2.0% | 0.7% | 1.4% | 1.0% |
| Fruit juice | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Tea, infusions | 0.3% | 0.7% | 0.0% | 0.3% | 0.0% | 0.3% |
| Honey | 3.7% | 10.2% | 14.1% | 9.3% | 9.2% | 9.3% |
| Other liquids | 65.7% | 59.9% | 67.9% | 81.0% | 83.4% | 71.7% |

[32] Black et al. 2008; Engle et al. 2007; Grantham-McGregor et al. 2007; Victora et al. 2008; Walker et al. 2007.

[33] Colostrum is produced prior to mature breast milk during pregnancy and through the first 3–6 days of life. It contains not only necessary nutrients but also properties that help protect the baby from viral and bacterial infections.

Plain water was given to the majority of the children (79.7 percent), followed by breast milk (78.4 percent), and homemade porridge (23.4 percent). With respect to food, 67.7 percent of the children received solid or semi-solid food 2.67 times on average. When asked about dietary supplements, 9.1 percent of caregivers reported giving iron pills or syrup to her child and 71.7 percent affirmed having ever given vitamin A. A large number of caregivers (58.2 percent) also mentioned that the children feed themselves.

The survey also included a section of caregiver behavior towards child discipline (only for caregivers of children under the age of two). Findings are summarized in Table 25 and indicate that while 54 percent of the caregivers explained to their children the reason why some behavior was inappropriate, 30.3 percent shook their child during the last month, 20.4 percent shouted or yelled at them, 37.8 percent spanked or slapped the child, and 8.7 percent used an insulting name. Although over one-third of the caregivers reported having spanked or slapped their under two-year-old child during the previous month,

**TABLE 24:** INFANT/YOUNG CHILD FEEDING (CHILDREN <2)

| | Wealth quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| **Liquids Given Yesterday (% Children):** | | | | | | |
| Breast milk | 84.8% | 83.0% | 78.0% | 73.3% | 73.0% | 78.4% |
| Plain water | 85.6% | 80.5% | 82.4% | 73.9% | 76.6% | 79.7% |
| Infant formula | 6.3% | 5.1% | 7.2% | 12.9% | 20.0% | 10.3% |
| Fortified child food | 1.4% | 1.4% | 4.2% | 8.1% | 11.3% | 5.3% |
| Homemade porridge | 16.4% | 18.6% | 22.0% | 31.1% | 28.6% | 23.4% |
| Other milks | 3.3% | 7.1% | 7.9% | 12.0% | 16.5% | 9.4% |
| Fruit juice | 0.9% | 1.1% | 2.3% | 1.5% | 7.1% | 2.6% |
| Caffeine beverages | 7.9% | 11.5% | 17.1% | 13.5% | 9.9% | 12.0% |
| Quinqueliba tea | 4.9% | 4.8% | 5.3% | 7.2% | 10.6% | 6.6% |
| Honey | 0.2% | 1.1% | 2.8% | 4.6% | 4.9% | 2.8% |
| Other Herbal teas | 0.5% | 0.9% | 0.5% | 0.4% | 0.2% | 0.5% |
| % of children that were given solid or semi-solid food yesterday | 61.6% | 65.3% | 64.2% | 71.2% | 76.2% | 67.7% |
| Average number of times food was given yesterday | 2.54 | 2.72 | 2.49 | 2.70 | 2.87 | 2.67 |
| **Food Given Yesterday (% Children):** | | | | | | |
| Cereal, rice, other grain-based food | 96.9% | 92.4% | 92.6% | 92.8% | 89.5% | 92.7% |
| Potatoes, yucca, other roots | 26.3% | 40.7% | 47.8% | 56.0% | 61.3% | 47.3% |
| Fruits or vegetables rich in vitamin A (carrots, yams, mango, papaya, green leaf vegetables) | 43.9% | 60.7% | 64.1% | 77.4% | 77.9% | 65.7% |
| Other fruits or vegetables | 35.0% | 46.2% | 44.4% | 48.0% | 56.4% | 46.4% |
| Meat, fish, eggs | 63.1% | 68.7% | 66.7% | 79.3% | 76.1% | 71.3% |
| Beans, peas, lentils | 36.3% | 42.5% | 40.4% | 39.4% | 39.3% | 39.6% |
| Oil, butter, other fats | 61.2% | 60.2% | 68.1% | 75.6% | 73.9% | 68.3% |
| **% of children that ever received vitamin A supplements** | 66.1% | 72.5% | 72.2% | 73.3% | 74.6% | 71.7% |
| **% of children that were given iron pills or syrup** | 3.6% | 8.4% | 8.4% | 10.3% | 14.8% | 9.1% |
| **% of children that feed themselves** | 65.4% | 56.7% | 55.2% | 60.6% | 53.8% | 58.2% |

only 23 percent of caregivers stated that physical punishment is necessary in order to raise and educate a child.

Furthermore, there were specific questions related to household support for learning and development. These include the availability of play objects, and the frequency with which adults engaged children in various activities demonstrated to promote language and cognitive development. Table 26 shows that 67.7 percent of the children under the age of two played with household objects and 42.1 percent of them played with toys. Only 1.1 percent of the children attend an early education programs; this may be due to the fact that many centers only serve children three to five years of age. While the majority of children played with an adult (84.7 percent) or were taken on an outing outside the home (80.9 percent) in the past three days, only 6.7 percent caregivers read books or told stories to the child in the past three days which increases to 14.5 percent for the wealthiest household caregivers.

Finally, this survey also considered maternal depression, as it is an important determinant of the child's health environment. Table 27 presents the most common symptoms

**TABLE 25:** DISCIPLINE MEASURES TOWARDS INFANT DURING PREVIOUS MONTH (CHILDREN <2)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Caregiver took away or forbade something | 41.3% | 42.2% | 48.8% | 52.1% | 56.0% | 48.1% |
| Caregiver explained why the behavior was wrong | 54.3% | 55.1% | 55.6% | 55.2% | 49.6% | 54.0% |
| Caregiver shook the child (% caregivers) | 18.0% | 22.4% | 22.1% | 40.0% | 48.4% | 30.3% |
| Caregiver shouted or yelled at the child | 15.8% | 18.6% | 19.6% | 24.5% | 23.3% | 20.4% |
| Caregiver gave the child something else to do | 73.1% | 67.7% | 75.0% | 69.3% | 75.5% | 72.1% |
| Caregiver spanked, slapped the child | 33.8% | 34.9% | 33.9% | 42.3% | 44.1% | 37.8% |
| Caregiver hit the child on the bottom or elsewhere | 13.7% | 10.6% | 14.5% | 17.0% | 12.4% | 13.7% |
| Caregiver used an insulting name | 7.6% | 7.7% | 5.0% | 9.4% | 14.1% | 8.7% |
| Caregiver thinks that physical punishment is necessary | 27.6% | 25.2% | 21.6% | 19.2% | 21.7% | 23.0% |

**TABLE 26:** INFANT/YOUNG CHILD LEARNING ENVIRONMENT (CHILDREN <2)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Child plays with household objects (% children) | 70.4% | 69.4% | 65.1% | 67.5% | 66.1% | 67.7% |
| Child plays with toys (% children) | 24.1% | 34.0% | 35.2% | 52.1% | 64.6% | 42.1% |
| Child attended early education programs (% children) | 0.7% | 1.2% | 1.2% | 0.4% | 2.0% | 1.1% |
| Adult reads books with child (% adults) | 0.2% | 5.0% | 3.8% | 9.2% | 15.7% | 6.7% |
| Adult tells stories to child (% adults) | 17.5% | 22.7% | 16.7% | 18.1% | 18.7% | 18.7% |
| Adult sings songs with child (% adults) | 72.1% | 73.9% | 75.0% | 67.9% | 58.8% | 69.6% |
| Adult take child outside home (% adults) | 81.3% | 81.4% | 81.3% | 81.7% | 78.5% | 80.9% |
| Adult plays with child (% adults) | 81.1% | 85.5% | 85.7% | 82.8% | 88.4% | 84.7% |
| Adult spend time naming, counting, drawing with child (% adults) | 21.5% | 31.3% | 26.9% | 28.6% | 24.8% | 26.6% |

of depression for those mothers who answered being depressed "Sometimes or about half the time," or "Most or all the time." Results show that 6.5 percent of the mothers felt depressed most or all of the time during the last seven days, and 15.6 percent declared feeling depressed sometimes or about half the time. More than 23 percent of these mothers felt sad sometimes or most of the time, 23.9 percent felt lonely, 22.4 percent declared feeling fearful, and a large percentage, 39 percent, experienced restless sleep.

A mother is interviewed about her child's health.

## 3.6 Child Growth and Development Measures

**Key Findings:**

- Nearly 13 percent of children in poor households are underweight, and almost 20 percent experience stunted growth.
- Children among households with a designated place for handwashing with soap and water are less likely to be malnourish.
- Malnutrition measures seem correlated with income; however the pattern for stunted growth is clearer than that for underweight and wasted growth, which do not have such clear pattern.
- A higher degree of development is observed for those children living in households with access to a handwashing place with soap and water, access to improved sanitation, or access to improved water.

The survey included baseline growth measures of children under the age of two, including arm and head circumference, weight, and length/height. This information is important in order to assess the average growth of the children. To analyze the child growth findings, anthropometric z-scores were estimated by comparing children in the sample to the WHO reference population mean and standard deviation, for each of the aforementioned variables.[34] The reference population is designed to be internationally

**TABLE 27:** MATERNAL DEPRESSION

| | Felt Depressed | Everything Demands Huge Effort | Felt Fearful | Restless Sleep | Was Happy | Felt Lonely |
|---|---|---|---|---|---|---|
| Never or rarely (% caregivers) | 43.3% | 35.7% | 41.6% | 32.9% | 10.8% | 46.4% |
| Little of the time or occasionally (% caregivers) | 34.6% | 37.9% | 36.1% | 28.0% | 22.8% | 29.7% |
| Sometimes or about half the time (% caregivers) | 15.6% | 17.9% | 16.6% | 25.1% | 30.6% | 15.8% |
| Most or all of the time (% caregivers) | 6.5% | 8.5% | 5.8% | 13.9% | 35.8% | 8.1% |

| | Felt People Unfriendly | Enjoyed Life | Felt Disliked by Others | Felt Sad | Could Not Get Going |
|---|---|---|---|---|---|
| Never or rarely (% caregivers) | 64.2% | 11.2% | 65.3% | 39.9% | 47.5% |
| Little of the time or occasionally (% caregivers) | 23.8% | 21.1% | 22.2% | 36.7% | 31.5% |
| Sometimes or about half the time (% caregivers) | 9.0% | 34.3% | 9.2% | 18.1% | 14.6% |
| Most or all of the time (% caregivers) | 3.1% | 33.4% | 3.3% | 5.4% | 6.4% |

[34] WHO 2006, 2007.

applicable regardless of ethnicity, socioeconomic status, or feeding practices.

The z-score (or standard score) indicates the number of standard deviations an observation or measure is above or below the mean of a reference population. As the mean is normalized to zero, any negative z-scores would be below the mean, and any positive z-scores would be above the mean. Z-scores are not only useful to assess the average growth and development of children against a reference population, but also to compare levels of growth and development among households with different characteristics, wealth levels, or regions.

Anthropometric z-scores are also used to determine whether a child is malnourished. The three main nutritional status conditions concerned in anthropometric assessment are underweight, stunting, and wasting. Underweight indicates whether a child has low weight-for-age and, although it does not take into consideration the height of the child, is the most common measure used to assess child nutrition. Stunting indicates whether a child has low height-for-age and reflects linear growth achieved pre- and postnatal. As height-for-age is considered a measure of past nutrition, stunting is generally assumed to indicate long-term, cumulative effects of inadequate nutrition and poor health status. Wasting indicates low weight-for-height and can be calculated without knowing the age of the child. Weight-for-age is a measure of current body mass and is sensitive to changes in calorie intake or the effects of disease; thus wasting is a measure of acute or short-term exposure to a negative environment. The WHO considers a child is malnourished if any of these three indexes fall below two standard deviations (SD) of the median value of the reference population, and severe malnutrition occurs when the indexes fall below three standard deviations of the median value.[35]

Table 28 presents the percentage of children being underweight, stunted or wasted. On average, 10.2 percent of the children in the sample were underweight, 12.7 percent were stunted and 8.9 percent were wasted. When data is disaggregated by wealth, the most notable difference among wealth quintiles is for stunting, since the percentage of stunted

The anthropometric team measures child's length.

children in the 1st or 2nd wealth quintiles (18.5 percent and 15.5 percent, respectively) is much higher than those in the wealthiest quintile (6.6 percent). The figures by region do not seem to vary considerably, with the exemption of Fatick, where the findings show a higher percentage of wasted children than in the other three regions. The findings vary significantly by sanitary condition. For instance, underweight and stunting rates are lower among households with access to a place for handwashing, improved water sources or improved sanitation. Among children living in households with a place for handwashing, underweight is about four percentage points lower than in those without a designated place (7.6 percent versus 11.4 percent); similarly, stunting is over 5 percentage points lower (8.9 percent versus 14.5 percent) and wasting almost three percentage points (6.8 percent versus 9.9 percent). Households with access to improved sanitation and improved water also have lower rates of underweight and stunted children; however access to improved water and sanitation does not seem to be associated with lower rates of wasted growth.

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.

[35] WHO 1995.

**TABLE 28:** PREVALENCE OF UNDERWEIGHT, STUNTING AND WASTING (CHILDREN <2)

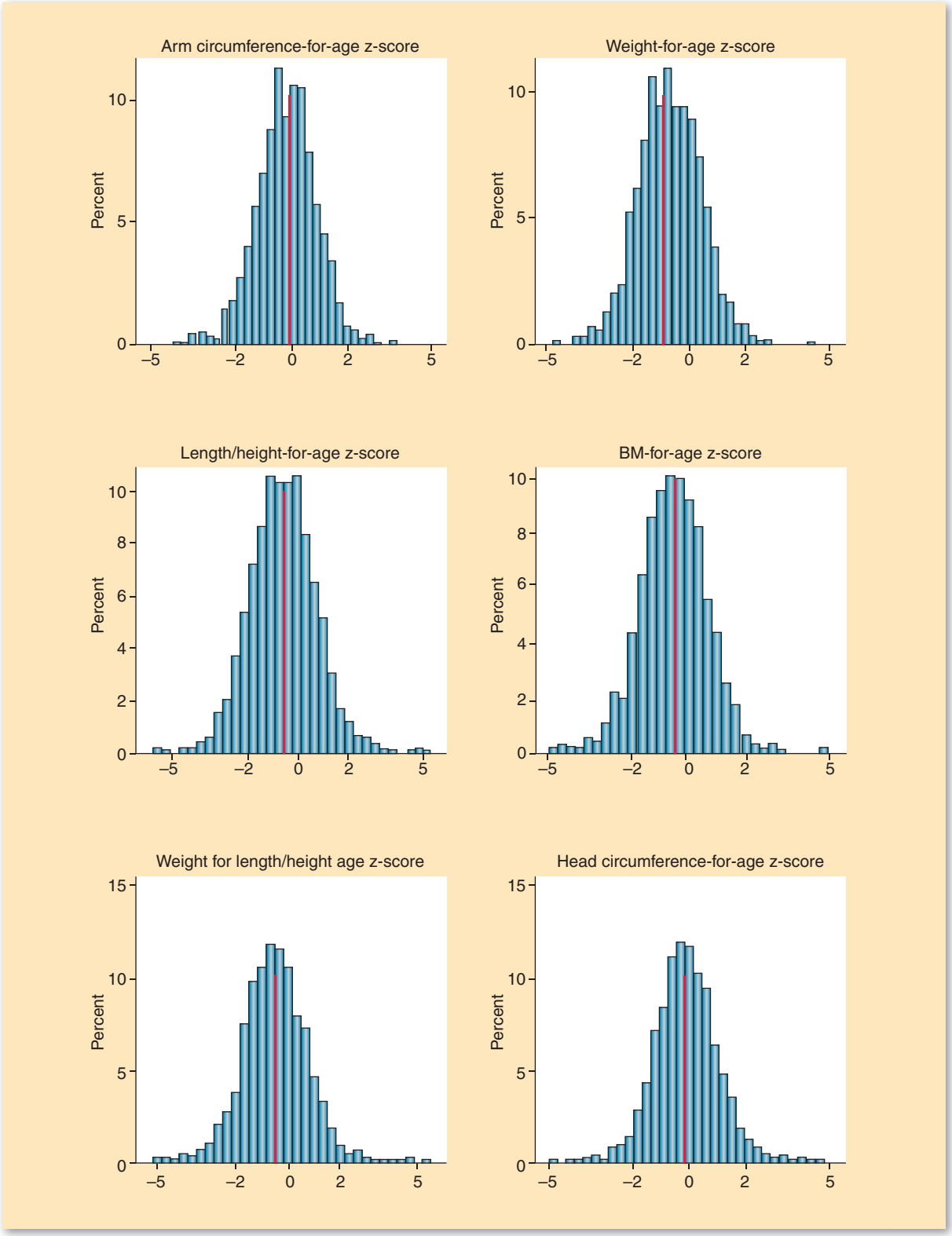
| | Underweight (% Children under -2 SDs Weight-for-Age z-score) | Stunted (% Children under -2 SDs Height-for-Age z-score) | Wasted (% Children under -2 SDs Weight-for-Height z-score) |
|---|---|---|---|
| **By Sanitation Condition:** | | | |
| Improved water source | 9.6% | 11.3% | 9.1% |
| Unimproved water source | 11.8% | 16.0% | 8.6% |
| Improved Sanitation | 10.1% | 11.0% | 8.9% |
| Unimproved sanitation | 10.4% | 17.1% | 8.8% |
| Place for handwashing with soap and water | 7.6% | 8.9% | 6.8% |
| No place for handwashing with soap and water | 11.4% | 14.5% | 9.9% |
| **By Wealth Quintile:** | | | |
| 1st | 12.6% | 18.5% | 11.0% |
| 2nd | 10.7% | 15.5% | 6.6% |
| 3rd | 9.2% | 11.6% | 10.2% |
| 4th | 11.4% | 11.9% | 8.4% |
| 5th | 7.2% | 6.6% | 8.4% |
| **By Region:** | | | |
| Fatick | 11.0% | 13.4% | 10.6% |
| Kaolack | 11.6% | 13.3% | 8.5% |
| St. Louis | 11.5% | 14.5% | 9.5% |
| Thiès | 10.2% | 12.7% | 8.9% |
| **Overall** | **10.2%** | **12.7%** | **8.9%** |

All measures, besides arm and head circumference, were found to be lower on average than the WHO reference population mean, as indicated by a red vertical line on the graph. 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 underweight 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 cut-off points in the length/height-for-age z-score and weight-for-length/height histograms respectively.[36]

Tables 29 present average z-scores for the six child-growth measures disaggregated by sanitary condition, wealth level, and region. With a few exceptions, children coming from households with a designated place for handwashing, improved water sources, or improved sanitation had higher z-scores for most anthropometric measures included in the analysis. In particular, these differences are larger for weight-for-age and height/length-for-age. For instance, z-scores for length/height-for-age are higher among households with a place for handwashing with soap and water (–0.30 SD versus –0.67 SD for those without), access to improved water (–0.45 SD versus –0.81 SD for those without), and access to improved sanitation (–0.43 SD versus –0.88 SD for those without). Wealth is also particularly correlated with weight-for-age and height/length-for-age, and not so much with the other anthropometric measures.

[36] Calculated z-scores below –5 and above 5 for weight-for-age and z-scores below –6 and above 6 for length/height-for-age and weight-for-length/height are considered to be implausible and therefore are not included in the prevalence statistics presented in Table 28.

**FIGURE 2:** HISTOGRAMS OF ANTHROPOMETRIC MEASURES (Z-SCORES, CHILDREN <2)



On average, weight-for-age and height/length-for-age z-scores for children in the highest wealth quintile are –0.48 SD and –0.16 SD, respectively, compared to –0.87 SD and –0.92 SD for those children in the lowest wealth quintile. When disaggregated by regions, figures do not vary much, but z-scores for five out of the six measures are lower in Kaolack than in the other regions.

Figure 3 presents the average z-score corresponding to each variable disaggregated by age and sex. While the survey is a cross section of households, and it is not possible to observe the evolution of child growth measures over time for the children sampled, it is possible to 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. A striking result is that, with the exception of the evolution of the average body mass index for age z-score, there is a negative relationship between z-score and age in

**TABLE 29A:** ANTHROPOMETRIC MEASURES (Z-SCORES) BY SANITARY CONDITIONS (CHILDREN <2)

| | Improved Sanitation | | Improved Water Source | | Soap and Water at HW Station | |
|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No |
| Average Arm Circumference-for-age z-score | –0.21 | –0.11 | –0.17 | –0.20 | –0.13 | –0.21 |
| Average Weight-for-age z-score | –0.63 | –0.79 | –0.61 | –0.81 | –0.50 | –0.75 |
| Average Length/Height-for-age z-score | –0.43 | –0.88 | –0.45 | –0.81 | –0.30 | –0.67 |
| Average Body Mass Index-for-age z-score | –0.48 | –0.36 | –0.45 | –0.44 | –0.41 | –0.46 |
| Average Weight-for-Length/Height z-score | –0.50 | –0.44 | –0.47 | –0.51 | –0.42 | –0.51 |
| Average Head Circumference-for-age z-score | –0.05 | –0.07 | –0.04 | –0.08 | –0.06 | –0.05 |

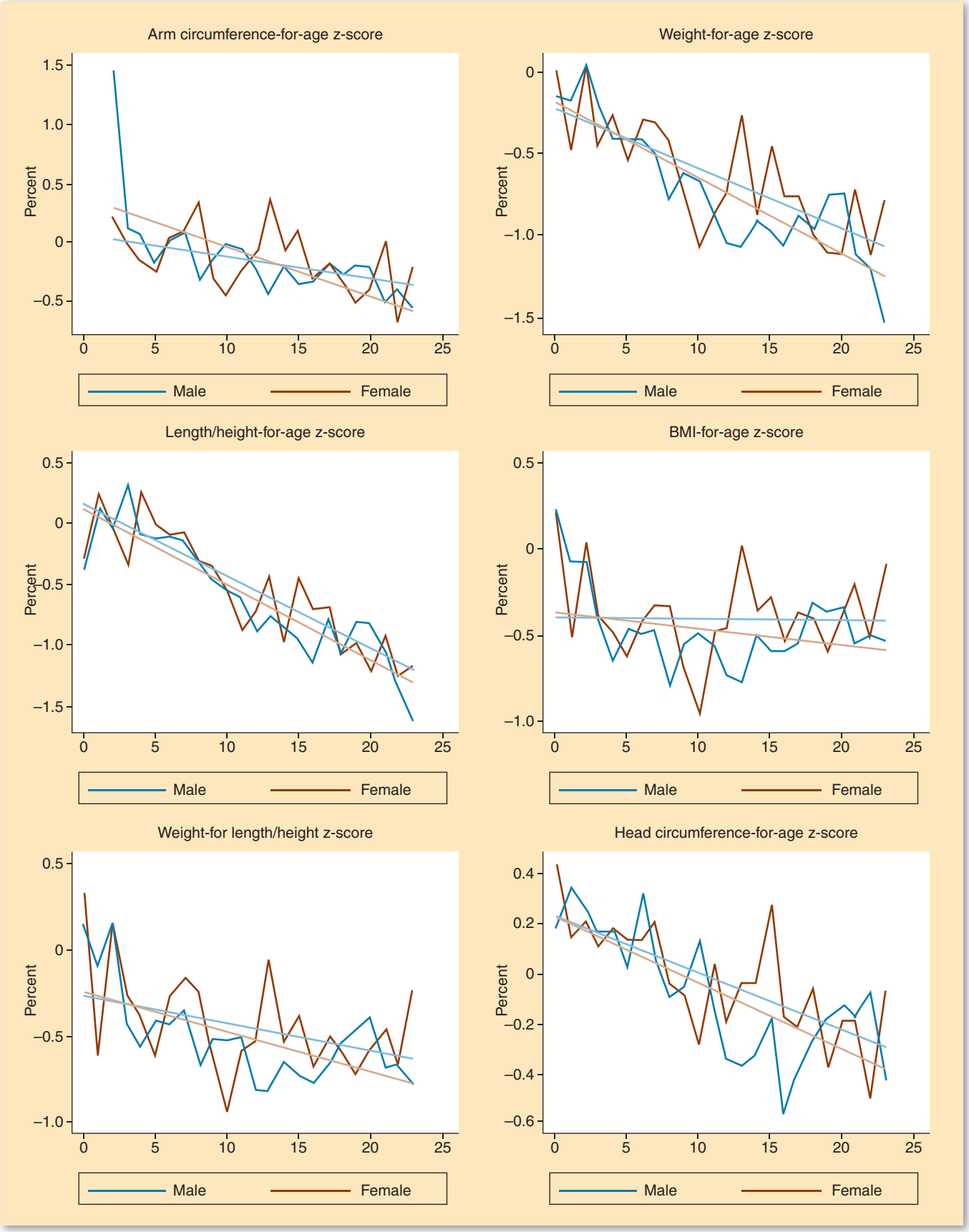
**TABLE 29B:** ANTHROPOMETRIC MEASURES (Z-SCORES) BY WEALTH QUINTILE (CHILDREN <2)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Average Arm Circumference-for-age z-score | –0.07 | –0.32 | –0.14 | –0.18 | –0.19 | –0.18 |
| Average Weight-for-age z-score | –0.87 | –0.78 | –0.64 | –0.62 | –0.48 | –0.67 |
| Average Length/Height-for-age z-score | –0.92 | –0.83 | –0.54 | –0.38 | –0.16 | –0.56 |
| Average Body Mass Index-for-age z-score | –0.45 | –0.35 | –0.47 | –0.51 | –0.46 | –0.45 |
| Average Weight-for-Length/Height z-score | –0.52 | –0.40 | –0.50 | –0.56 | –0.44 | –0.48 |
| Average Head Circumference-for-age z-score | –0.09 | –0.05 | -0.02 | –0.05 | –0.07 | –0.05 |

**TABLE 29C:** ANTHROPOMETRIC MEASURES (Z-SCORES) BY REGION (CHILDREN <2)

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| Average Arm Circumference-for-age z-score | 0.15 | –0.24 | –0.06 | –0.30 | –0.18 |
| Average Weight-for-age z-score | –0.68 | –0.78 | –0.63 | –0.58 | –0.67 |
| Average Length/Height-for-age z-score | –0.63 | –0.71 | –0.55 | –0.40 | –0.56 |
| Average Body Mass Index-for-age z-score | –0.40 | –0.52 | –0.39 | –0.42 | –0.45 |
| Average Weight-for-Length/Height z-score | –0.44 | –0.56 | –0.44 | –0.44 | –0.48 |
| Average Head Circumference-for-age z-score | –0.10 | –0.05 | 0.03 | –0.07 | –0.05 |

**FIGURE 3:** ANTHROPOMETRIC MEASURES (Z-SCORES) BY SEX AND MONTHS OF AGE (CHILDREN <2)



An anthropometrician carries a stadiometer to measure children's height/length.

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 mean 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.[37]

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 it is impossible to know whether the downward trend shown for most measures will continue as females reach age two years and beyond.

The survey also included a section related to child development, in which caregivers were asked a number of questions about the child's reaction to specific stimuli (i.e., response to mother's voice, reaction to seeing self in a mirror) or whether the child has yet achieved various milestones (i.e., sitting, walking, saying some words, etc.). Three domains were measured: communication skills, including pre-verbal babbling as well as producing and understanding language; gross motor skills, including control of certain postures or coordination of movements requiring large muscle systems; and personal-social skills or behaviors related to engaging with others, as well as to becoming independent. Scores on these types of outcomes have been useful for discriminating between groups of children with different environmental (poverty, etc.) and biological (stunting, etc.) profiles. The questions administered to each child were selected to measure a range of behaviors representing lower- to higher-than average development per age range (based on U.S. estimates of age-related behaviors, as international standards are not available). With this information, a "degree of child development" index per skill was computed, with higher scores representing a higher level of development in that domain. Tables 30A, 30B, and 30C present the z-scores for these variables disaggregated by sanitary conditions, wealth status, and region.

For every type of skill a lower degree of development was systematically observed in those children that come from households without improved sanitation, without an improved water source, and without soap and water at the handwashing station. Although no inferences can

[37] Victora, et al. 2010

**TABLE 30A:** CHILD DEVELOPMENT Z-SCORES BY SANITARY CONDITIONS (CHILDREN <2)

| | Improved Sanitation | | Improved Water Source | | Soap and Water at HW Station | |
|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No |
| Average communication skills-for-age z-score | 0.06 | –0.15 | 0.04 | –0.09 | 0.10 | –0.05 |
| Average gross motor skills-for-age z-score | 0.06 | –0.15 | 0.04 | –0.09 | 0.09 | –0.05 |
| Average personal-social skills-for-age z-score | 0.05 | –0.13 | 0.04 | –0.10 | 0.18 | –0.09 |

**TABLE 30B:** CHILD DEVELOPMENT Z-SCORES BY WEALTH QUINTILE (CHILDREN <2)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | Total |
| Average communication skills-for-age z-score | –0.19 | 0.02 | –0.13 | 0.01 | 0.25 | 0.00 |
| Average gross motor skills-for-age z-score | –0.10 | –0.02 | –0.04 | –0.08 | 0.20 | 0.00 |
| Average personal-social skills-for-age z-score | –0.22 | 0.00 | –0.02 | -0.03 | 0.21 | 0.00 |

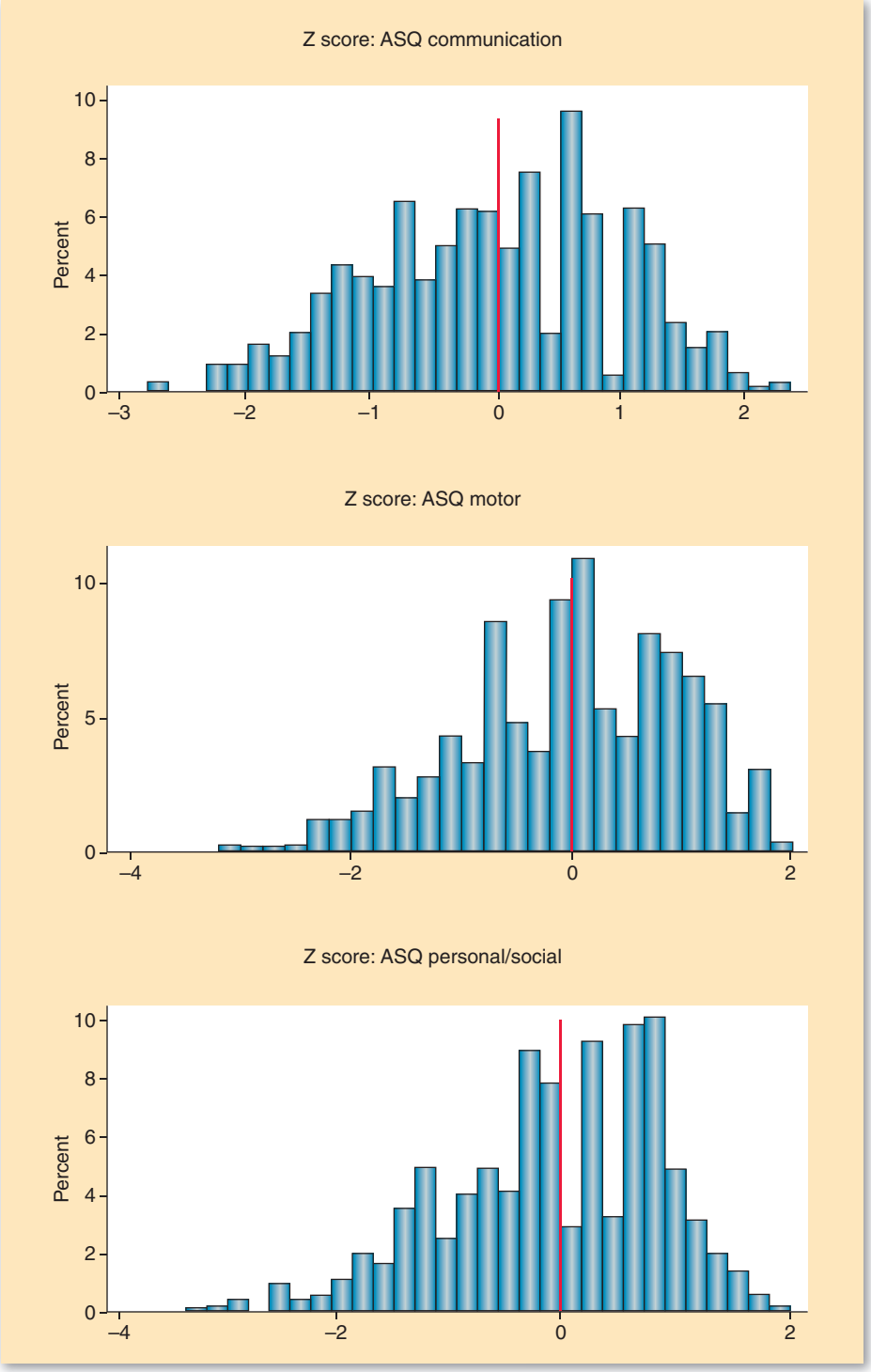
**TABLE 30C:** CHILD DEVELOPMENT Z-SCORES BY REGION (CHILDREN <2)

| | Region | | | | |
|---|---|---|---|---|---|
| | Fatick | Kaolack | St. Louis | Thiès | Total |
| Average communication skills-for-age z-score | 0.15 | –0.01 | –0.26 | 0.02 | 0.00 |
| Average gross motor skills-for-age z-score | 0.28 | 0.04 | –0.32 | –0.04 | 0.00 |
| Average personal-social skills-for-age z-score | 0.20 | –0.20 | –0.06 | 0.08 | 0.00 |

be made about causal relationship between the variables, the figures show a correlation between the sanitary conditions and the degree of child's development. When compared across the different wealth groups, the findings show a huge increase from the 1st quintile to the 5th quintile; however, there are no uniform patterns between the 2nd quintile to the 4th quintile. When disaggregating the findings by regions, Fatick far exceeds St. Louis for all development z-scores—e.g. average gross motor skills-for-age z-score is 0.28 for Fatick whereas it is -0.32 for St. Louis.

Figure 4 shows the histograms for the three variables' z-scores. All of them have a mean value equal to 0.

**FIGURE 4:** HISTOGRAMS OF CHILD DEVELOPMENT MEASURES (Z-SCORES, CHILDREN <2)



## 3.7 Parasite Prevalence

**Key Findings:**

- *Giardia* was detected in over 10 percent of the children stools samples, and *Cryptosporidium,* another parasite that affects intestines and is typically an acute short-term infection, in over 17 percent of the samples.
- Giardia prevalence is higher among households with no access to a handwashing station with soap and water, no access to improved sanitation, or no access to improved water. This is not the case for *Cryptosporidium.* It is worth noting, however, that stool samples were collected only in a subsample of 99 households; therefore not much weight should be allocated to these correlations.

The survey also collected stool samples on a subsample of 99 households to examine the presence of parasites. Baseline data on the presence of parasites in the household may allow better future understandings of the mechanism by which the treatment operates, whether it is through the mother or the child. In particular, the focus is set in the presence of bacteria parasites such as *Giardia,* a parasite that colonizes and reproduces in the small intestine, causing giardiasis; and *Cryptosporidium,* another parasite that affects intestines and is typically an acute short-term infection, causing cryptosporidiosis.

*Giardia* was detected in 11.2 percent of the stool samples, and *Crystosporidium* was found in 17.3 percent of the stool samples. Prevalence of *Crystosporidium* is much lower among households with access to improved sanitation (14.7 percent) than those with unimproved sanitation (26.1 percent). Similarly, *Crystosporidium* prevalence is lower among households with access to improved water sources (14.5 percent) than those with unimproved water (24.1 percent). The lowest prevalence of *Crystosporidium* is found among households with a handwashing station stocked with soap and water (11.1 percent) and it increases to 19.7 percent for those without such facility. However, prevalence of *Giardia* does not follow the same pattern, and findings show higher levels of *Giardia* prevalence among those households with access to improved water, improved sanitation, and a handwashing station with soap and water. Prevalence of parasites does not seem to be strongly correlated with wealth. For instance, the highest levels of prevalence of *Giardia* are observed among the 3rd quintile. In the case of *Crystosporidium*, households among the two bottom wealth quintiles had a much higher percentage of *Crystosporidium* detected in

Stool samples are collected to test for presence of parasites.

**TABLE 31A:** PARASITES PREVALENCE IN STOOL SAMPLES BY SANITARY CONDITIONS (CHILDREN <2)

| | Improved Sanitation | | Improved Water Source | | Soap and Water at HW Station | |
|---|---|---|---|---|---|---|
| (N=99) | Yes | No | Yes | No | Yes | No |
| *Giardia* detected in Stool Sample (% of selected HHs) | 12.0% | 8.7% | 11.6% | 10.3% | 14.8% | 9.9% |
| *Cryptosporidium* detected in Stool Sample (% of selected HHs) | 14.7% | 26.1% | 14.5% | 24.1% | 11.1% | 19.7% |

**TABLE 31B:** PARASITES PREVALENCE IN STOOL SAMPLES BY WEALTH QUINTILE (CHILDREN <2)

| | Wealth Quintile | | | | | |
|---|---|---|---|---|---|---|
| (Subsample; N=99) | 1st | 2nd | 3rd | 4th | 5th | Total |
| *Giardia* detected in Stool Sample (% of selected HHs) | 10.0% | 15.8% | 16.7% | 4.5% | 7.7% | 11.2% |
| *Cryptosporidium* detected in Stool Sample (% of selected HHs) | 25.0% | 26.3% | 12.5% | 13.6% | 7.7% | 17.3% |

**TABLE 31C:** PARASITES PREVALENCE IN STOOL SAMPLES BY GEOGRAPHIC AREA (CHILDREN <2)

| | Region | | | | |
|---|---|---|---|---|---|
| (Subsample; N=99) | Fatick | Kaolack | St. Louis | Thiès | Total |
| *Giardia* detected in Stool Sample (% of selected HHs) | 10.5% | 14.3% | 10.0% | 8.8% | 11.2% |
| *Cryptosporidium* detected in Stool Sample (% of selected HHs) | 5.3% | 17.1% | 10.0% | 26.5% | 17.3% |

their stools samples than those among than the top one, but nevertheless the pattern is not clear.

It is worth noting that the sample size for parasite prevalence is very small (stool samples were collected in 99 households only) so not much weight should be allocated to these correlations. Stool samples were collected during the baseline survey to assess whether its collection and analysis was feasible, and the findings are presented for information purposes only. Since no major problems were observed during the baseline, stool samples will be collected in larger samples sizes during the endline survey, and therefore the findings of the impact assessment will be more meaningful.

# IV. Conclusion

The findings presented in this report provide a snapshot of baseline characteristics of the target population in regard to household demographics, socioeconomic situation, mother's and other caretaker's handwashing behavior, access to improved sanitation and water, and key child health and development indicators. Low baseline rates of both handwashing with soap at critical times and access to a place for handwashing stocked with soap and water, indicates that there is scope for improving handwashing behavior in the target population, particularly among the poorest.

The subsequent collection and analysis of the post-intervention data, in conjunction with the longitudinal data, will enable a close examination of the links between poor handwashing behavior, poor health, and longer-term child development. The baseline survey identifies large proportions of children who are below average in terms of weight, length/height, and arm and head circumference for their age. Diarrhea is relatively high compared to other Global Scaling Up project countries and anemia affects the large majority of children. The impact evaluation aims to identify to what extent these outcomes are attributable to lack of handwashing with soap and to quantify the extent to which the project is able to improve these vital aspects of child health.

As outlined in the methodology section, the impact evaluation study utilizes a series of household and community surveys. These include the baseline, 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 ongoing and expected to be completed by mid 2011. Data analysis and impact assessments will be conducted soon after, and a full impact evaluation report of the Global Scaling Up Rural Handwashing Project will be published by the end of 2011.

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# Annex 1: List of Districts Included in WSP Sample

**TABLE 32:** LIST OF COLLECTIVITÉS LOCALES SELECTED FOR TREATMENT

| | | | Collectivités Locales | | |
|---|---|---|---|---|---|
| N. | Region | Department | Commune | Communauté rurale | (Arrondissement) |
| 1 | Fatick | Fatick | Fatick | | |
| 2 | Fatick | Fatick | Fatick | | |
| 3 | Fatick | Fatick | Fatick | | |
| 4 | Fatick | Fatick | Fatick | | |
| 5 | Fatick | Fatick | Fatick | | |
| 6 | Fatick | Fatick | | Diakhao | Diakhao |
| 7 | Fatick | Fatick | | Niakhar | Niakhar |
| 8 | Fatick | Fatick | | Fimela | Fimela |
| 9 | Fatick | Foundiougne | | Diossong | Djilor |
| 10 | Fatick | Foundiougne | | Djilor | Djilor |
| 11 | Fatick | Foundiougne | | Nioro Allassane | Toubacouta |
| 12 | Kaolack | Kaffrine | | Birkilane | Birkilane |
| 13 | Kaolack | Kaffrine | | Diokoul Mbellbouck | Nganda |
| 14 | Kaolack | Kaffrine | | Nganda | Nganda |
| 15 | Kaolack | Kaffrine | | Ida Mouride | Maka Yop |
| 16 | Kaolack | Kaffrine | | Maka Yop | Maka Yop |
| 17 | Kaolack | Kaolack | | Keur Baka | Koumbal |
| 18 | Kaolack | Kaolack | | Latmingué | Koumbal |
| 19 | Kaolack | Kaolack | | Keur Socé | Ndiedieng |
| 20 | Kaolack | Nioro | | Gainthe Kaye | Paoskoto |
| 21 | Kaolack | Nioro | | Prokhane | Paoskoto |
| 22 | Kaolack | Nioro | | Keur Maba Diakhou | Wack Ngouna |
| 23 | Kaolack | Nioro | | Ndrame Escale | Wack Ngouna |
| 24 | Kaolack | Nioro | | Wack Ngouna | Wack Ngouna |
| 25 | Kaolack | Nioro | | Kaymor | Médina Sabakh |

| | | | Collectivités Locales | | |
|---|---|---|---|---|---|
| N. | Region | Department | Commune | Communauté rurale | (Arrondissement) |
| 26 | Kaolack | Nioro | | Médina Sabakh | Médina Sabakh |
| 27 | Saint Louis | Dagana | Richard Toll | | |
| 28 | Saint Louis | Dagana | | Ross Bethio | Ross-Bethio |
| 29 | Saint Louis | Dagana | | Gae | Mbane |
| 30 | Saint Louis | Dagana | | Mbane | Mbane |
| 31 | Saint Louis | Saint Louis | Saint Louis | | |
| 32 | Saint Louis | Saint Louis | Saint Louis | | |
| 33 | Saint Louis | Saint Louis | | Mpal | Rao |
| 34 | Thiès | Mbour | Mbour | | |
| 35 | Thiès | Mbour | Mbour | | |
| 36 | Thiès | Mbour | Mbour | | |
| 37 | Thiès | Mbour | Mbour | | |
| 38 | Thiès | Mbour | Mbour | | |
| 39 | Thiès | Mbour | Mbour | | |
| 40 | Thiès | Mbour | | Ngueniene | Sessene |
| 41 | Thiès | Mbour | | Ndiaganiao | Fissel |
| 42 | Thiès | Mbour | | Sessene | Sessene |
| 43 | Thiès | Thiès | Pout | | |
| 44 | Thiès | Thiès | Pout | | |
| 45 | Thiès | Thiès | | Fandene | K Mousseu |
| 46 | Thiès | Thiès | | Notto | Notto |
| 47 | Thiès | Thiès | | Ndieyene Sirakh | Thieneba |
| 48 | Thiès | Thiès | | Ngoundiane | Thieneba |
| 49 | Thiès | Thiès | | Thieneba | Thieneba |
| 50 | Thiès | Thiès | | Touba Toul | Thieneba |
| 51 | Thiès | Tivaouane | | Darou Khoudoss | Meouane |
| 52 | Thiès | Tivaouane | | Meouane | Meouane |
| 53 | Thiès | Tivaouane | | Koulor | Merina Dakhar |
| 54 | Thiès | Tivaouane | | Pekess | Merina Dakhar |
| 55 | Thiès | Tivaouane | | Merina Dakhar | Merina Dakhar |

**TABLE 33:** LIST OF COMMUNE AND COMMUNAUTE RURALE TO SERVE AS CONTROL

| | | | Collectivités Locales | | |
|---|---|---|---|---|---|
| N. | Region | Department | Commune | Communauté rurale | (Arrondissement) |
| 1 | Fatick | Fatick | | Diarrere | Tattaguine |
| 2 | Fatick | Fatick | | Diouroup | Tattaguine |
| 3 | Fatick | Fatick | | Tattaguine | Tattaguine |
| 4 | Fatick | Fatick | | Ngayokheme | Niakhar |
| 5 | Fatick | Fatick | | Patar | Niakhar |
| 6 | Fatick | Foundiougne | | Keur Saloum Dian | Toubacouta |
| 7 | Fatick | Foundiougne | | Keur Samba Gueye | Toubacouta |
| 8 | Fatick | Foundiougne | | Toubacouta | Toubacouta |
| 9 | Fatick | Gossas | | Mbar | Colobane |
| 10 | Kaolack | Kaffrine | Kaffrine | | |
| 11 | Kaolack | Kaffrine | Kaffrine | | |
| 12 | Kaolack | Kaffrine | Kaffrine | | |
| 13 | Kaolack | Kaffrine | Kaffrine | | |
| 14 | Kaolack | Kaffrine | | Mabo | Birkilane |
| 15 | Kaolack | Kaffrine | | Ndiognick | Birkilane |
| 16 | Kaolack | Kaffrine | | Boulel | Maleme Hoddar |
| 17 | Kaolack | Kaffrine | | Malem Hodar | Maleme Hoddar |
| 18 | Kaolack | Kaffrine | | Kathiotte | Nganda |
| 19 | Kaolack | Kaffrine | | Lour Escale | Maka Yop |
| 20 | Kaolack | Kaffrine | | Saly Escale | Maka Yop |
| 21 | Kaolack | Kaolack | Kaolack | | |
| 22 | Kaolack | Kaolack | Kaolack | | |
| 23 | Kaolack | Kaolack | Kaolack | | |
| 24 | Kaolack | Kaolack | Kaolack | | |
| 25 | Kaolack | Kaolack | Kaolack | | |
| 26 | Kaolack | Kaolack | Kaolack | | |
| 27 | Kaolack | Kaolack | | Dya | Sibassor |
| 28 | Kaolack | Kaolack | | Thiaré | Koumbal |
| 29 | Kaolack | Kaolack | | Ndiafatt | Ndiedieng |
| 30 | Kaolack | Kaolack | | Ndiedieng | Ndiedieng |
| 31 | Kaolack | Nioro | | Paoskoto | Paoskoto |
| 32 | Kaolack | Nioro | | Taiba Niassene | Paoskoto |
| 33 | Kaolack | Nioro | | Ngayene | Medina Sabakh |
| 34 | Saint Louis | Dagana | Dagana | | |
| 35 | Saint Louis | Dagana | Dagana | | |

| | | | Collectivités Locales | | |
|---|---|---|---|---|---|
| N. | Region | Department | Commune | Communauté rurale | (Arrondissement) |
| 36 | Saint Louis | Dagana | | Ronkh | Ross-Bethio |
| 37 | Saint Louis | Saint Louis | | Gandon | Rao |
| 38 | Thiès | Mbour | Joal Fadiouth | | |
| 39 | Thiès | Mbour | Joal Fadiouth | | |
| 40 | Thiès | Mbour | | Malicounda | Sindia |
| 41 | Thiès | Mbour | | Sindia | Sindia |
| 42 | Thiès | Mbour | | Diass | Sindia |
| 43 | Thiès | Mbour | | Fissel | Fissel |
| 44 | Thiès | Mbour | | Sandiara | Sessene |
| 45 | Thiès | Thiès | | Diender Guedji | K Mousseu |
| 46 | Thiès | Thiès | | Keur Moussa | K Mousseu |
| 47 | Thiès | Thiès | | Tassette | Nott |
| 48 | Thiès | Tivaouane | Tivaouane | | |
| 49 | Thiès | Tivaouane | Tivaouane | | |
| 50 | Thiès | Tivaouane | Mboro | | |
| 51 | Thiès | Tivaouane | | Cherif Lo | Pambal |
| 52 | Thiès | Tivaouane | | Notto Gouye Diama | Pambal |
| 53 | Thiès | Tivaouane | | Pire Goureye | Pamba |
| 54 | Thiès | Tivaouane | | Taiba Ndiaye | Taiba Ndiaye |
| 55 | Thiès | Tivaouane | | Ngandiouf | Niakhene |

# Annex 2: Test of Baseline Balance

As mentioned in Section II: Methodology, a critical requirement of the IE methodology is to create an appropriate counterfactual for the treatment group. This section presents the mean comparison tests across the treatment and the control group for an exhaustive list of indicators included in the baseline survey.

Surveyed households possess many unobserved characteristics not included in the database, and thus cannot be evaluated to see if they are balanced. However, if a sufficiently large amount of observed variables are balanced across the treatment group, then there would be little reason to believe that the unobserved variables are not balanced.

The standard errors used in those tests were clustered at the district level, allowing the possibility of intra-district correlation. For the comparison groups—Treatment versus Control—the null hypothesis of mean equality at the 10 percent level was rejected in 8.53 percent of the answers (22 out of 258 answers).

Test of balance for the key indicators included in the IE baseline are presented in the following tables.

**TABLE 34:** HOUSEHOLD DEMOGRAPHICS, LABOR AND EDUCATION

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| HH size | 782 | 12.237 | 0.356 | 768 | 12.181 | 0.426 | 0.100 | 0.920 |
| Number of children under five years of age (per HH) | 782 | 2.707 | 0.089 | 768 | 2.664 | 0.085 | 0.350 | 0.726 |
| Age | 9567 | 20.240 | 0.297 | 9355 | 20.339 | 0.220 | –0.270 | 0.787 |
| Age of HH head | 782 | 50.771 | 0.731 | 768 | 50.133 | 0.819 | 0.581 | 0.561 |
| Age of other HH members | 8785 | 17.522 | 0.282 | 8587 | 17.675 | 0.226 | –0.423 | 0.672 |
| HH head is male | 782 | 0.868 | 0.021 | 768 | 0.876 | 0.020 | –0.275 | 0.783 |
| Other HH members are male | 8787 | 0.425 | 0.006 | 8587 | 0.434 | 0.008 | –0.964 | 0.335 |
| **Education:** | | | | | | | | |
| HH head ever attended school | 773 | 0.281 | 0.033 | 758 | 0.276 | 0.031 | 0.110 | 0.913 |
| Other HH members ever attended school | 6580 | 0.421 | 0.032 | 6474 | 0.455 | 0.030 | –0.770 | 0.441 |
| Currently in school | 2511 | 0.646 | 0.023 | 2720 | 0.658 | 0.015 | –0.415 | 0.678 |
| Currently in vacation | 1598 | 0.973 | 0.014 | 1743 | 0.936 | 0.023 | 1.399 | 0.162 |
| **Teenager Spent Time On:** | | | | | | | | |
| School | 2504 | 0.026 | 0.016 | 2479 | 0.035 | 0.014 | –0.434 | 0.664 |
| Studying | 2500 | 0.031 | 0.012 | 2474 | 0.063 | 0.014 | –1.773 | 0.076 |
| Children care | 2351 | 0.410 | 0.022 | 2256 | 0.405 | 0.024 | 0.136 | 0.892 |
| Homework | 2296 | 0.505 | 0.023 | 2234 | 0.510 | 0.022 | –0.160 | 0.873 |
| Paid work | 2509 | 0.004 | 0.001 | 2475 | 0.008 | 0.002 | –1.629 | 0.103 |
| Unpaid work | 2411 | 0.254 | 0.026 | 2363 | 0.208 | 0.025 | 1.272 | 0.203 |
| **Work and Earnings** | | | | | | | | |
| Monthly salary for primary work (in CFA) | 1210 | 43,864 | 4,879 | 1147 | 50,062 | 6,286 | –0.779 | 0.436 |
| Hours worked per week for primary work | 2235 | 43.542 | 1.302 | 2166 | 43.947 | 0.919 | –0.254 | 0.799 |
| Monthly salary for secondary work (in CFA) | 301 | 33,382 | 6,390 | 217 | 23,193 | 3,712 | 1.379 | 0.168 |
| Hours worked per week for secondary work | 546 | 32.881 | 1.782 | 437 | 30.629 | 1.774 | 0.895 | 0.371 |
| HH head is employed | 782 | 0.811 | 0.016 | 768 | 0.835 | 0.016 | –1.069 | 0.285 |
| Others in HH are employed | 9569 | 0.197 | 0.008 | 9355 | 0.192 | 0.008 | 0.490 | 0.624 |
| Females in HH are employed | 941 | 0.505 | 0.029 | 919 | 0.476 | 0.027 | 0.742 | 0.458 |
| Helped in the family business | 2157 | 0.705 | 0.021 | 2207 | 0.720 | 0.023 | –0.479 | 0.632 |

**TABLE 35:** HOUSEHOLD ASSETS

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| HH non-labor income | 781 | 0.269 | 0.023 | 766 | 0.312 | 0.026 | –1.242 | 0.214 |
| **Assets:** | | | | | | | | |
| Radio, CD, cassette player | 782 | 0.716 | 0.020 | 768 | 0.688 | 0.024 | 0.911 | 0.362 |
| Television | 782 | 0.359 | 0.045 | 768 | 0.471 | 0.048 | –1.718 | 0.086 |
| VCR, DVD | 782 | 0.133 | 0.025 | 768 | 0.210 | 0.028 | –2.031 | 0.042 |
| Computer | 782 | 0.028 | 0.010 | 768 | 0.026 | 0.006 | 0.181 | 0.856 |
| Bicycle | 782 | 0.074 | 0.013 | 768 | 0.103 | 0.013 | –1.596 | 0.111 |
| Motorcycle | 782 | 0.055 | 0.009 | 768 | 0.072 | 0.010 | –1.207 | 0.227 |
| Automobile or truck | 782 | 0.026 | 0.006 | 768 | 0.052 | 0.011 | –2.210 | 0.027 |
| Refrigerator | 782 | 0.088 | 0.020 | 768 | 0.133 | 0.023 | –1.463 | 0.143 |
| Gas stove | 782 | 0.047 | 0.012 | 768 | 0.052 | 0.013 | –0.274 | 0.784 |
| Other stove | 780 | 1.509 | 0.126 | 768 | 1.603 | 0.041 | –0.710 | 0.478 |
| Other houses/properties | 779 | 1.714 | 0.179 | 762 | 1.833 | 0.134 | –0.534 | 0.593 |
| Machinery, equipment for family business | 771 | 1.791 | 0.129 | 758 | 1.950 | 0.012 | –1.229 | 0.219 |
| Mixer | 782 | 0.010 | 0.005 | 768 | 0.007 | 0.003 | 0.697 | 0.486 |
| Water Boiler | 782 | 0.003 | 0.002 | 768 | 0.005 | 0.003 | –0.738 | 0.461 |
| HH owns other piece of land (over all HHs) | 781 | 0.686 | 0.045 | 768 | 0.617 | 0.046 | 1.077 | 0.282 |
| HH has all animals (over all HHs) | 782 | 0.679 | 0.058 | 768 | 0.603 | 0.054 | 0.963 | 0.336 |
| HH owns farm equipment (over all HHs) | 782 | 0.826 | 0.034 | 768 | 0.788 | 0.031 | 0.837 | 0.403 |

**TABLE 36:** HOUSEHOLD COMPOSITION

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| Rooms in dwelling | 772 | 4.921 | 0.194 | 762 | 4.936 | 0.179 | –0.056 | 0.956 |
| **Dwelling Lighting Source:** | | | | | | | | |
| No lighting | 782 | 0.001 | 0.001 | 768 | 0.001 | 0.001 | –0.013 | 0.990 |
| Electricity | 782 | 0.289 | 0.053 | 768 | 0.469 | 0.059 | –2.266 | 0.023 |
| Kerosene | 782 | 0.004 | 0.002 | 768 | 0.004 | 0.002 | –0.023 | 0.982 |
| Wood | 782 | 0.019 | 0.008 | 768 | 0.009 | 0.004 | 1.111 | 0.266 |
| Peat, manure | 782 | 0.003 | 0.002 | 768 | 0.001 | 0.001 | 0.572 | 0.567 |
| Candles | 782 | 0.113 | 0.023 | 768 | 0.081 | 0.016 | 1.136 | 0.256 |
| Battery | 782 | 0.294 | 0.045 | 768 | 0.180 | 0.042 | 1.851 | 0.064 |
| Other | 782 | 0.274 | 0.043 | 768 | 0.253 | 0.046 | 0.333 | 0.739 |
| **Dwelling Cooking Fuel:** | | | | | | | | |
| Electricity | 782 | 0.006 | 0.003 | 767 | 0.003 | 0.002 | 1.010 | 0.313 |
| Gas | 782 | 0.178 | 0.040 | 767 | 0.151 | 0.030 | 0.534 | 0.593 |
| Coal | 782 | 0.038 | 0.010 | 767 | 0.086 | 0.020 | –2.145 | 0.032 |
| Wood | 782 | 0.743 | 0.046 | 767 | 0.733 | 0.039 | 0.169 | 0.866 |
| Peat, manure | 782 | 0.017 | 0.012 | 767 | 0.009 | 0.005 | 0.605 | 0.545 |
| Candles | 782 | 0.001 | 0.001 | 767 | 0.003 | 0.002 | –0.598 | 0.550 |

*continued*

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| Battery | 782 | 0.004 | 0.002 | 767 | 0.001 | 0.001 | 1.015 | 0.310 |
| Other | 782 | 0.013 | 0.004 | 767 | 0.012 | 0.008 | 0.114 | 0.909 |
| **Dwelling Ownership:** | | | | | | | | |
| Other | 777 | 0.431 | 0.044 | 763 | 0.384 | 0.041 | 0.791 | 0.429 |
| HH member, still paying | 777 | 0.021 | 0.007 | 763 | 0.028 | 0.008 | –0.671 | 0.502 |
| HH member, fully paid | 777 | 0.443 | 0.034 | 763 | 0.448 | 0.036 | –0.110 | 0.912 |
| Rented | 777 | 0.050 | 0.013 | 763 | 0.062 | 0.016 | –0.554 | 0.580 |
| Family, friend loan | 777 | 0.055 | 0.010 | 763 | 0.079 | 0.012 | –1.479 | 0.139 |
| **HH Source of Drinking Water:** | | | | | | | | |
| Other | 779 | 0.013 | 0.005 | 768 | 0.016 | 0.006 | –0.346 | 0.730 |
| Piped water, into dwelling | 779 | 0.064 | 0.023 | 768 | 0.107 | 0.023 | –1.327 | 0.185 |
| Piped water, into yard, plot | 779 | 0.249 | 0.041 | 768 | 0.283 | 0.041 | –0.580 | 0.562 |
| Piped water, public tap, stand | 779 | 0.175 | 0.027 | 768 | 0.314 | 0.042 | –2.796 | 0.005 |
| Tube well, borehole | 779 | 0.001 | 0.001 | 768 | 0.001 | 0.001 | –0.010 | 0.992 |
| Dug well, protected | 779 | 0.081 | 0.020 | 768 | 0.061 | 0.019 | 0.700 | 0.484 |
| Dug well, unprotected | 779 | 0.336 | 0.048 | 768 | 0.178 | 0.040 | 2.539 | 0.011 |
| Spring water, protected | 779 | 0.023 | 0.014 | 768 | 0.027 | 0.017 | –0.193 | 0.847 |
| Spring water, unprotected | 779 | 0.010 | 0.004 | 768 | 0.013 | 0.006 | –0.382 | 0.703 |
| **Water Source Location:** | | | | | | | | |
| In own dwelling | 399 | 0.023 | 0.012 | 226 | 0.035 | 0.031 | –0.386 | 0.699 |
| In own yard, plot | 399 | 0.028 | 0.009 | 226 | 0.013 | 0.007 | 1.219 | 0.223 |
| Elsewhere | 399 | 0.950 | 0.016 | 226 | 0.951 | 0.031 | –0.041 | 0.967 |
| **Covered Source:** | | | | | | | | |
| Covered | 375 | 0.176 | 0.040 | 226 | 0.296 | 0.072 | –1.461 | 0.144 |
| Open | 375 | 0.781 | 0.047 | 226 | 0.695 | 0.075 | 0.979 | 0.327 |
| Both covered and open | 375 | 0.043 | 0.017 | 226 | 0.009 | 0.006 | 1.842 | 0.065 |
| **HH Member Who Collects Water from Source:** | | | | | | | | |
| Adult woman | 529 | 0.900 | 0.025 | 459 | 0.961 | 0.009 | –2.274 | 0.023 |
| Adult man | 529 | 0.062 | 0.018 | 459 | 0.020 | 0.006 | 2.207 | 0.027 |
| Girl (< 15 years) | 529 | 0.030 | 0.010 | 459 | 0.009 | 0.004 | 2.005 | 0.045 |
| Boy (< 15 years) | 529 | 0.004 | 0.003 | 459 | 0.011 | 0.006 | –1.153 | 0.249 |
| Other | 529 | 0.004 | 0.003 | 459 | 0.000 | 0.000 | 1.398 | 0.162 |
| **More on Water Source:** | | | | | | | | |
| Same water source throughout year | 781 | 0.971 | 0.018 | 768 | 0.991 | 0.004 | –1.099 | 0.272 |
| Satisfied with the quantity of water | 768 | 0.698 | 0.032 | 764 | 0.707 | 0.031 | –0.200 | 0.841 |
| Household pays for water | 770 | 0.590 | 0.054 | 766 | 0.765 | 0.045 | –2.497 | 0.013 |
| **HH Main Toilet Facility:** | | | | | | | | |
| Flush, to piped sewer system | 781 | 0.032 | 0.022 | 764 | 0.018 | 0.006 | 0.610 | 0.542 |
| Flush, to other place | 781 | 0.431 | 0.044 | 764 | 0.441 | 0.042 | –0.159 | 0.874 |
| Ventilated improved pit latrine | 781 | 0.038 | 0.012 | 764 | 0.064 | 0.019 | –1.159 | 0.246 |
| Pit latrine with slab | 781 | 0.197 | 0.027 | 764 | 0.158 | 0.017 | 1.231 | 0.218 |
| Pit latrine without slab | 781 | 0.044 | 0.011 | 764 | 0.046 | 0.010 | –0.153 | 0.879 |
| No facilities, bush | 781 | 0.222 | 0.040 | 764 | 0.211 | 0.036 | 0.199 | 0.842 |
| Other | 781 | 0.036 | 0.008 | 764 | 0.062 | 0.012 | –1.848 | 0.065 |

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| **Toilet Public/Private:** | | | | | | | | |
| Public | 571 | 0.053 | 0.013 | 574 | 0.080 | 0.015 | –1.421 | 0.155 |
| Private | 571 | 0.947 | 0.013 | 574 | 0.920 | 0.015 | 1.421 | 0.155 |
| **Location of Main Toilet Facility:** | | | | | | | | |
| Inside dwelling | 776 | 0.202 | 0.028 | 760 | 0.342 | 0.034 | –3.175 | 0.001 |
| In household yard | 776 | 0.491 | 0.038 | 760 | 0.353 | 0.032 | 2.814 | 0.005 |
| Less than 10 minutes walk | 776 | 0.090 | 0.014 | 760 | 0.093 | 0.017 | –0.143 | 0.886 |
| More than 10 minutes walk | 776 | 0.045 | 0.013 | 760 | 0.037 | 0.009 | 0.524 | 0.600 |
| No designated area | 776 | 0.166 | 0.037 | 760 | 0.167 | 0.034 | –0.017 | 0.986 |
| Other | 776 | 0.005 | 0.002 | 760 | 0.008 | 0.004 | –0.630 | 0.529 |
| **Disposal of Child Feces:** | | | | | | | | |
| Bushes, ground | 782 | 0.193 | 0.034 | 768 | 0.152 | 0.027 | 0.937 | 0.349 |
| Pit, hole in the ground | 782 | 0.107 | 0.015 | 768 | 0.134 | 0.016 | –1.230 | 0.219 |
| Open sewer, drain | 782 | 0.012 | 0.009 | 768 | 0.009 | 0.003 | 0.251 | 0.802 |
| Toilet, latrine | 782 | 0.570 | 0.036 | 768 | 0.572 | 0.037 | –0.025 | 0.980 |
| Garbage | 782 | 0.073 | 0.017 | 768 | 0.083 | 0.014 | –0.475 | 0.635 |
| River | 782 | 0.004 | 0.003 | 768 | 0.004 | 0.002 | –0.020 | 0.984 |
| Other | 782 | 0.069 | 0.016 | 768 | 0.072 | 0.013 | –0.123 | 0.902 |
| **Walling Materials:** | | | | | | | | |
| Brick | 774 | 0.658 | 0.044 | 763 | 0.689 | 0.046 | –0.500 | 0.617 |
| Concrete | 774 | 0.021 | 0.007 | 763 | 0.017 | 0.007 | 0.370 | 0.711 |
| Unbaked brick, adobe | 774 | 0.001 | 0.001 | 763 | 0.005 | 0.003 | –1.163 | 0.245 |
| Wood, logs | 774 | 0.030 | 0.013 | 763 | 0.016 | 0.006 | 0.961 | 0.336 |
| Other | 774 | 0.291 | 0.041 | 763 | 0.273 | 0.044 | 0.299 | 0.765 |
| **Roofing Materials:** | | | | | | | | |
| Brick | 775 | 0.052 | 0.015 | 762 | 0.034 | 0.008 | 1.057 | 0.291 |
| Concrete | 775 | 0.046 | 0.012 | 762 | 0.073 | 0.014 | –1.454 | 0.146 |
| Wood, logs | 775 | 0.062 | 0.014 | 762 | 0.043 | 0.012 | 0.989 | 0.323 |
| Tin, zinc sheeting | 775 | 0.574 | 0.039 | 762 | 0.546 | 0.032 | 0.557 | 0.578 |
| Bamboo | 775 | 0.019 | 0.006 | 762 | 0.017 | 0.006 | 0.272 | 0.786 |
| Concrete | 775 | 0.006 | 0.004 | 762 | 0.014 | 0.008 | –0.913 | 0.361 |
| Other | 775 | 0.240 | 0.035 | 762 | 0.272 | 0.037 | –0.624 | 0.533 |
| **Flooring Materials:** | | | | | | | | |
| Concrete | 779 | 0.008 | 0.003 | 762 | 0.003 | 0.002 | 1.438 | 0.151 |
| Soil, sand | 779 | 0.262 | 0.039 | 762 | 0.249 | 0.038 | 0.230 | 0.818 |
| Cement | 779 | 0.510 | 0.034 | 762 | 0.417 | 0.030 | 2.044 | 0.041 |
| Tiles | 779 | 0.050 | 0.013 | 762 | 0.084 | 0.014 | –1.804 | 0.071 |
| Other | 779 | 0.163 | 0.024 | 762 | 0.241 | 0.035 | –1.855 | 0.064 |

**TABLE 37:** HANDWASHING FACILITIES

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| HH handwashing after using toilet | 778 | 0.860 | 0.018 | 763 | 0.827 | 0.022 | 1.146 | 0.252 |
| HH handwashing before/after food preparation | 781 | 0.883 | 0.018 | 764 | 0.880 | 0.018 | 0.154 | 0.878 |
| **Location of Handwashing Facility (after using toilet):** | | | | | | | | |
| Inside toilet facility | 668 | 0.240 | 0.024 | 628 | 0.228 | 0.021 | 0.369 | 0.712 |
| Inside food preparation area | 668 | 0.003 | 0.002 | 628 | 0.024 | 0.006 | –3.264 | 0.001 |
| In yard, less than 3 feet from toilet facility | 668 | 0.213 | 0.021 | 628 | 0.260 | 0.023 | –1.509 | 0.131 |
| In yard, between 3–10 feet from toilet facility | 668 | 0.087 | 0.013 | 628 | 0.053 | 0.009 | 2.157 | 0.031 |
| In yard, more than 10 feet from toilet facility | 668 | 0.024 | 0.007 | 628 | 0.025 | 0.006 | –0.168 | 0.866 |
| No specific place | 668 | 0.434 | 0.035 | 628 | 0.411 | 0.033 | 0.485 | 0.628 |
| **Type of Handwashing Facility (after using toilet):** | | | | | | | | |
| Tap, faucet | 368 | 0.095 | 0.036 | 355 | 0.113 | 0.023 | –0.409 | 0.682 |
| Basin, bucket | 368 | 0.334 | 0.030 | 355 | 0.361 | 0.032 | –0.594 | 0.553 |
| Container from which water is poured | 368 | 0.429 | 0.040 | 355 | 0.389 | 0.035 | 0.765 | 0.444 |
| Water available at handwashing station | 348 | 0.787 | 0.030 | 337 | 0.807 | 0.023 | –0.521 | 0.602 |
| **Soaps Available at the Place for Washing Hands (after using toilet):** | | | | | | | | |
| Multipurpose bar soap | 669 | 0.272 | 0.027 | 631 | 0.311 | 0.026 | –1.015 | 0.310 |
| Beauty, toilet bar soap | 669 | 0.009 | 0.004 | 631 | 0.011 | 0.004 | –0.354 | 0.724 |
| Powder soap, detergent | 669 | 0.070 | 0.012 | 631 | 0.068 | 0.011 | 0.128 | 0.898 |
| No soap observed | 669 | 0.173 | 0.021 | 631 | 0.162 | 0.019 | 0.411 | 0.681 |
| **Location of Handwashing Facility (during food preparation):** | | | | | | | | |
| Inside toilet facility | 689 | 0.012 | 0.005 | 670 | 0.007 | 0.003 | 0.722 | 0.470 |
| Inside food preparation area | 689 | 0.062 | 0.012 | 670 | 0.066 | 0.013 | –0.181 | 0.857 |
| In yard, less than 3 feet from cooking facility | 689 | 0.184 | 0.026 | 670 | 0.216 | 0.026 | –0.876 | 0.381 |
| In yard, between 3–10 feet from cooking facility | 689 | 0.148 | 0.017 | 670 | 0.145 | 0.014 | 0.150 | 0.881 |
| In yard, more than 10 feet from cooking facility | 689 | 0.086 | 0.011 | 670 | 0.054 | 0.011 | 2.028 | 0.043 |
| No specific place | 689 | 0.508 | 0.027 | 670 | 0.512 | 0.031 | –0.096 | 0.923 |
| **Type of Handwashing Facility (during food preparation):** | | | | | | | | |
| Tap, faucet | 303 | 0.026 | 0.012 | 299 | 0.043 | 0.012 | –1.000 | 0.317 |
| Basin, bucket | 303 | 0.706 | 0.028 | 299 | 0.692 | 0.032 | 0.331 | 0.741 |
| Water available at handwashing station | 293 | 0.648 | 0.035 | 281 | 0.737 | 0.031 | –1.896 | 0.058 |
| **Soaps Available at the Place for Washing Hands (during food preparation):** | | | | | | | | |
| Multipurpose bar soap | 324 | 0.386 | 0.034 | 314 | 0.414 | 0.036 | –0.565 | 0.572 |
| Beauty, toilet bar soap | 318 | 0.006 | 0.004 | 305 | 0.003 | 0.003 | 0.553 | 0.580 |
| Powder soap, detergent | 319 | 0.210 | 0.032 | 313 | 0.326 | 0.031 | –2.591 | 0.010 |
| No soap observed | 326 | 0.368 | 0.033 | 312 | 0.301 | 0.030 | 1.488 | 0.137 |
| HH has improved water source | 781 | 0.700 | 0.044 | 764 | 0.687 | 0.041 | 0.219 | 0.826 |
| HH has improved sanitation | 779 | 0.601 | 0.048 | 768 | 0.793 | 0.042 | –2.995 | 0.003 |
| HH has soap and water at HW station | 782 | 0.312 | 0.026 | 768 | 0.333 | 0.029 | –0.552 | 0.581 |

**TABLE 38:** HANDWASHING BEHAVIOR

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| **Last Moment of Hand Wash Since Yesterday:** | | | | | | | | |
| Bathing a child | 1040 | 0.525 | 0.027 | 984 | 0.434 | 0.027 | 2.379 | 0.017 |
| Bathing oneself | 1044 | 0.565 | 0.024 | 984 | 0.530 | 0.023 | 1.037 | 0.300 |
| Using toilet | 1033 | 0.141 | 0.014 | 976 | 0.169 | 0.016 | –1.324 | 0.186 |
| Cleaning baby bottom | 1034 | 0.106 | 0.015 | 978 | 0.100 | 0.013 | 0.308 | 0.758 |
| Cleaning latrine | 1033 | 0.028 | 0.006 | 976 | 0.009 | 0.003 | 2.643 | 0.008 |
| Cleaning toilet | 1033 | 0.065 | 0.012 | 976 | 0.049 | 0.008 | 1.101 | 0.271 |
| Returning home | 1034 | 0.056 | 0.010 | 977 | 0.055 | 0.008 | 0.065 | 0.948 |
| Preparing food, cooking | 1035 | 0.083 | 0.010 | 978 | 0.092 | 0.012 | –0.572 | 0.567 |
| Feeding children | 1033 | 0.042 | 0.009 | 976 | 0.039 | 0.006 | 0.256 | 0.798 |
| Washing child's hands | 1034 | 0.034 | 0.006 | 976 | 0.023 | 0.005 | 1.402 | 0.161 |
| Cleaning dishes | 1039 | 0.293 | 0.017 | 982 | 0.270 | 0.018 | 0.903 | 0.366 |
| Doing laundry | 1040 | 0.412 | 0.017 | 981 | 0.406 | 0.020 | 0.218 | 0.827 |
| When looked dirty | 1034 | 0.051 | 0.011 | 976 | 0.054 | 0.008 | –0.233 | 0.816 |
| Eating | 1035 | 0.114 | 0.014 | 979 | 0.122 | 0.012 | –0.417 | 0.677 |
| Other | 1033 | 0.014 | 0.004 | 976 | 0.027 | 0.006 | –1.724 | 0.085 |
| **Caregiver's Fingernails Appear to Be:** | | | | | | | | |
| Visibly dirt | 1024 | 0.119 | 0.015 | 980 | 0.089 | 0.010 | 1.646 | 0.100 |
| Unclean | 1024 | 0.166 | 0.016 | 980 | 0.186 | 0.018 | –0.828 | 0.408 |
| Clean | 1024 | 0.715 | 0.022 | 980 | 0.726 | 0.022 | –0.346 | 0.729 |
| **Caregiver's Palms Appear to Be:** | | | | | | | | |
| Visibly dirt | 1032 | 0.037 | 0.006 | 981 | 0.037 | 0.008 | 0.012 | 0.990 |
| Unclean | 1032 | 0.124 | 0.014 | 981 | 0.121 | 0.014 | 0.137 | 0.891 |
| Clean | 1032 | 0.839 | 0.017 | 981 | 0.842 | 0.017 | –0.122 | 0.903 |
| **Caregiver's Finger Pads Appear to Have:** | | | | | | | | |
| Visible dirt | 1032 | 0.043 | 0.007 | 978 | 0.035 | 0.008 | 0.745 | 0.456 |
| Unclean appearance | 1032 | 0.125 | 0.014 | 978 | 0.134 | 0.014 | –0.460 | 0.646 |
| Clean appearance | 1032 | 0.832 | 0.017 | 978 | 0.831 | 0.016 | 0.046 | 0.963 |
| **Best Way to Clean Hands:** | | | | | | | | |
| Wipe on cloth | 936 | 0.000 | 0.000 | 892 | 0.007 | 0.003 | –2.207 | 0.027 |
| Wash with water alone | 936 | 0.022 | 0.005 | 892 | 0.017 | 0.005 | 0.758 | 0.448 |
| Wash with soap | 936 | 0.973 | 0.006 | 892 | 0.973 | 0.007 | 0.022 | 0.982 |
| Wash with ash, mud | 936 | 0.002 | 0.001 | 892 | 0.003 | 0.002 | –0.431 | 0.667 |

**TABLE 39:** ALRI AND DIARRHEA PREVALENCE (% CHILDREN <5)

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| **Diarrhea symptoms:** | | | | | | | | |
| Diarrhea symptoms in previous 48 hours | 2123 | 0.066 | 0.009 | 2054 | 0.068 | 0.007 | –0.107 | 0.915 |
| Diarrhea in previous 7 days | 2123 | 0.097 | 0.011 | 2054 | 0.102 | 0.009 | –0.328 | 0.743 |
| Diarrhea in previous 14 days | 2123 | 0.106 | 0.011 | 2054 | 0.112 | 0.010 | –0.406 | 0.685 |
| **ALRI symptoms:** | | | | | | | | |
| ALRI in previous 48 hours | 2123 | 0.017 | 0.003 | 2054 | 0.019 | 0.004 | –0.400 | 0.689 |
| ALRI in previous 7 days | 2123 | 0.023 | 0.004 | 2054 | 0.026 | 0.005 | –0.519 | 0.604 |
| ALRI in previous 14 days | 2123 | 0.024 | 0.004 | 2054 | 0.029 | 0.005 | –0.648 | 0.517 |
| Average hours spent on Child Caring last week | 2026 | 2.135 | 0.032 | 1961 | 2.125 | 0.028 | 0.222 | 0.824 |
| Household lost working hours due to child illness (over all HHs) | 7277 | 0.204 | 0.031 | 8478 | 0.292 | 0.035 | –1.900 | 0.057 |
| **Diarrhea Treatment:** | | | | | | | | |
| No treatment | 296 | 0.672 | 0.040 | 288 | 0.750 | 0.030 | –1.568 | 0.117 |
| Pill or syrup | 274 | 0.712 | 0.033 | 300 | 0.710 | 0.026 | 0.040 | 0.968 |
| Injection | 143 | 0.028 | 0.015 | 144 | 0.056 | 0.019 | –1.141 | 0.254 |
| Traditional remedies | 192 | 0.370 | 0.048 | 174 | 0.282 | 0.042 | 1.377 | 0.169 |
| Caregiver did not pay for diarrhea treatment | 75 | 0.240 | 0.071 | 58 | 0.190 | 0.052 | 0.574 | 0.566 |
| **ALRI Treatment:** | | | | | | | | |
| No treatment | 167 | 0.856 | 0.032 | 165 | 0.842 | 0.033 | 0.301 | 0.763 |
| Pill or syrup | 272 | 0.941 | 0.015 | 239 | 0.895 | 0.025 | 1.564 | 0.118 |
| Traditional remedies | 85 | 0.612 | 0.075 | 62 | 0.452 | 0.084 | 1.423 | 0.155 |
| Other | 46 | 0.304 | 0.084 | 48 | 0.271 | 0.067 | 0.311 | 0.756 |
| Caregiver did not pay for ALRI treatment | 23 | 0.174 | 0.079 | 23 | 0.130 | 0.092 | 0.359 | 0.720 |

**TABLE 40:** CHILD GROWTH AND ANEMIA (CHILDREN <2)

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| **Anthropometric measures:** | | | | | | | | |
| Arm circumference-for-age z-score | 908 | –0.192 | 0.056 | 834 | –0.168 | 0.060 | –0.290 | 0.771 |
| Weight-for-age z-score | 1006 | –0.691 | 0.053 | 932 | –0.654 | 0.049 | –0.508 | 0.611 |
| Length/height-for-age z-score | 992 | –0.591 | 0.062 | 916 | –0.519 | 0.065 | –0.809 | 0.419 |
| BMI-for-age z-score | 971 | –0.465 | 0.051 | 899 | –0.431 | 0.052 | –0.455 | 0.649 |
| Weight-for-length/height z-score | 1026 | –0.493 | 0.046 | 957 | –0.472 | 0.050 | –0.313 | 0.755 |
| Head circumference-for-age z-score | 1005 | –0.043 | 0.037 | 931 | –0.065 | 0.049 | 0.356 | 0.722 |
| Anemia (Hb <110g/L) | 785 | 0.907 | 0.013 | 779 | 0.908 | 0.012 | –0.032 | 0.974 |

**TABLE 41:** CHILD LEARNING ENVIRONMENT (CHILDREN <2)

| | Treatment | | | Control | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Avg. | SE | N | Avg. | SE | z-value | p-value |
| Plays with household objects | 1092 | 0.665 | 0.016 | 1035 | 0.690 | 0.015 | –1.125 | 0.261 |
| Plays with toys | 1090 | 0.417 | 0.029 | 1035 | 0.425 | 0.023 | –0.233 | 0.816 |
| Attends early education program | 1089 | 0.011 | 0.003 | 1033 | 0.011 | 0.004 | 0.079 | 0.937 |
| Adults read books with child | 1087 | 0.041 | 0.009 | 1032 | 0.095 | 0.016 | –2.956 | 0.003 |
| Adults tell stories to the child | 1087 | 0.169 | 0.016 | 1032 | 0.206 | 0.016 | –1.601 | 0.109 |
| Adults sing songs with child | 1083 | 0.682 | 0.025 | 1031 | 0.710 | 0.024 | –0.789 | 0.430 |
| Adults take the child outside the home | 1091 | 0.815 | 0.019 | 1036 | 0.802 | 0.017 | 0.505 | 0.614 |
| Adults play with the child | 1089 | 0.851 | 0.016 | 1036 | 0.842 | 0.018 | 0.404 | 0.686 |
| Adults spend time naming, counting, and drawing | 1087 | 0.245 | 0.022 | 1030 | 0.289 | 0.023 | –1.379 | 0.168 |

# Annex 3: Sample Representativeness

The experimental group for the project impact evaluation was designed with the primary intention of producing internally valid estimates of program impacts under the unique constraints of the project, and is not intended to be suitable for computing country, region, or commune level population statistics without additional assumptions. The experimental group is not a representative sample of the Senegalese population for several reasons:

- At the regional level, the experimental study includes only four out of a total of 11 regions that Senegal had when the baseline survey was conducted.
- At the commune level, the study includes only 88 out of 364 *collectivités locales* in Senegal. Additionally, these 88 *collectivités* were randomly selected for the purpose of the impact evaluation, rather than being weighted by population.
- At the household level, the study comprises only households with a child under the age of two at the time of the baseline survey.

Presented here is a comparison of basic characteristics of the Senegal population using the 2005 Senegal Demographic Health Survey (SNDHS) with characteristics of the individuals included in the WSP IE survey subsample. The two surveys compare demographics characteristics, household assets, and facility composition.

Table 42 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 households with children under two years old. As expected, on average, the individuals interviewed in the WSP survey are younger (20.3 years old) than those included in the SNDHS sample (22.3 years old). Similarly, while the average number of children under the age of five per household is 1.8 in the SNDHS, this figure is 2.7 in the WSP survey, again a likely factor of the unique sample selection of the WSP survey where each household must have a child under the age of two.

**TABLE 42:** HOUSEHOLD DEMOGRAPHICS

| | WSP Survey | DHS Survey |
|---|---|---|
| **Age (% Individuals):** | | |
| 0–4 | 22.1% | 16.8% |
| 5–9 | 16.3% | 15.0% |
| 10–14 | 11.4% | 13.4% |
| 15–19 | 9.0% | 11.2% |
| 20–24 | 8.2% | 8.2% |
| 25–29 | 6.4% | 6.6% |
| 30–34 | 5.6% | 5.3% |
| 35–39 | 4.8% | 4.4% |
| 40–44 | 3.3% | 3.7% |
| 45–49 | 2.9% | 3.2% |
| 50+ | 9.8% | 12.1% |
| Average age | 20.3 | 22.3 |
| HH size | 12.2 | 9.3 |
| **Total number of children under 5 (% HHs):** | | |
| 0 | 0.0% | 27.6% |
| 1 | 21.7% | 23.1% |
| 2 | 35.8% | 22.2% |
| 3 | 18.3% | 12.7% |
| 4 | 11.8% | 6.6% |
| 5 | 6.4% | 3.6% |
| >5 | 6.0% | 4.1% |
| Average number of children under 5 in HH | 2.7 | 1.8 |
| HH heads are male (% individuals) | 87.2% | 77.4% |
| **School Attendance (% of individuals, children > 5):** | | |
| Ever attended school | 41.7% | 41.2% |
| Currently enrolled in school | 23.1% | 22.4% |

Table 43 presents information on basic household composition. Overall the comparison shows very similar results across the two surveys. For drinking water sources, 26.6 percent of the HHs piped water into the yard in the WSP IE survey whereas 16.7 percent of the DHS survey reported this type of facility. The most common type of toilet facility in the

WSP IE survey consists of flush to septic tank (37.3 percent) and a similar proportion of households (33.4 percent) own the same type of facility in the DHS survey. Rates for open defecation are also similar among the respondents of both surveys. There is a parallel trend in floor materials between the two surveys; cement is the most popular type for both (WSP 46.4 percent and DHS 39.6 percent). As for asset ownership, a large number of households own radios in both the WSP and the DHS samples (70.3 percent and 86.4 percent respectively). Ownership of assets such as TV, video, computer, motorbike, automobile, refrigerator and washing machine also present very similar distributions between the two surveys; however, ownership of a bicycle or a stove show variation between the studies.

**TABLE 43:** DWELLING CHARACTERISTICS, HOUSEHOLD ASSETS AND ACCESS TO WATER AND SANITATION

| | WSP Survey | DHS Survey |
|---|---|---|
| **Sources of Drinking water (% of HHs with access to a drinking water source):** | | |
| Piped water, into yard, plot | 26.6% | 16.7% |
| Piped water, public tap, standpipe | 24.4% | 20.0% |
| Dug well, unprotected | 25.8% | 27.3% |
| **Type of Toilet Facility (% of HHs with access to a toilet facility):** | | |
| Flush, to septic tank | 37.3% | 33.4% |
| Pit latrine with slab | 17.8% | 24.2% |
| No facilities, bush, field | 21.6% | 25.8% |
| **Flooring Materials (% HHs):** | | |
| Linoleum, vinyl, asphalt | 12.6% | 11.7% |
| Soil, sand | 25.6% | 35.4% |
| Cement | 46.4% | 39.6% |
| **HH Assets:** | | |
| Radio | 70.3% | 86.4% |
| TV | 41.5% | 35.2% |
| Video | 17.2% | 11.4% |
| Computer | 2.7% | 1.5% |
| Bicycle | 8.9% | 16.3% |
| Motorbike | 6.3% | 7.0% |
| Automobile or truck | 3.9% | 6.0% |
| Refrigerator | 11.1% | 16.6% |
| Washing machine | 0.1% | 0.4% |
| Cooker | 37.9% | 21.0% |

wsp
water and
sanitation program

SANITATION
FOR ALL