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Abstract

This paper analyzes a randomized experiment that uses novel strategies to promote handwashing with soap at critical times in Peru. It evaluates a large-scale intervention that includes a mass media provincial campaign and a district-level community component. The analysis finds that the mass media intervention alone had no significant effect on exposure to the handwashing promotion campaign messages, and therefore no effect on handwashing knowledge or handwashing behavior. In contrast, the community-level intervention, a more comprehensive intervention that included several community and school activities in addition to the communications campaign, was successful in reaching the target audience with handwashing promotion messages and in improving the knowledge of the treated population on appropriate handwashing behavior. Those improvements translated into higher self-reported and observed handwashing with soap at critical junctures. However, no significant improvements in the health of children under the age of five were observed. The results are consistent with earlier literature, which indicates that substantively changing behavior to improve health is a complex task requiring intensive and more personalized interventions.

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Promoting Handwashing Behavior in Peru: The Effect of Large-Scale Mass-Media and Community Level Interventions†

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1 Introduction

Hygiene is essential to the public health mission of reducing the transmission and consequences of disease. The two leading causes of childhood mortality worldwide are diarrheal disease and acute respiratory infections,[4] accounting for two-thirds of the deaths of children under age five.[5] Both of these categories of illness are closely associated with inadequate hygiene. In addition, chronic parasitic infections and diarrhea can lead to anemia, which further hinders children's development.[6] The provision of safe water and sanitation, and improved hygienic behaviors more generally, has the potential to alleviate the proximate causes of these illnesses and thereby improve health.[7]

Medical evidence suggests that the hands are the main transmitters of diarrhea and respiratory infections. As such, they constitute disease vectors carrying respiratory microorganisms and fecal material into the domestic environment of the susceptible child.[8] Health experts recommend handwashing with soap as a critical action in protecting public health because it is a mainstay in infection control.[9] Yet, rates of handwashing with soap at critical times remain low throughout the world, even when both soap and water are available.[10] In a sample of developing countries, the observed rates of handwashing with soap

[4] Thirty-five percent of these deaths are due to diarrheal disease and 32 percent are due to acute respiratory infections. It was estimated that 21 percent of deaths in the 42 countries with the highest mortality are due to pneumonia (Black et al. 2003).

[5] WHO 2002.

[6] Curtis and Cairncross 2003.

[7] See, for example, Esrey et al. 1991 and Galiani et al. 2005.

[8] Hendley et al. 1973, WHO 2003.

[9] Most parasites live and breed in feces and are transmitted to humans when ingested or through the hands. Parasitic infestations pose serious threats to young children and are a cause of child mortality (World Bank 2005). Among those who survive, parasitic infestations are associated with diarrhea and micronutrient malnutrition, which often leads to iron-deficiency anemia, protein-energy malnutrition, and enlargement of the liver and spleen (see, among others, Anderson and May 1991; and Hesham et al. 2004). Currently, anemia, which leads to slow cognitive development, is a widespread global health problem (see, among others, Nokes et al. 1992, and Pollit 1990). In addition, some respiratory tract infections, including the SARS-causing corona virus, are transmitted via the fecal-oral route or simply on hands (World Bank 2005). Hence, adequate handwashing is a primary barrier to the transmission of enteric pathogens, as hands can be cleansed of viruses and bacteria by washing with soap (Curtis and Cairncross 2003), (Faix 1987; Ansari et al. 1989; Luby et al. 2001; Gibson et al. 2002; Montville et al. 2002; Larson et al. 2003).

[10] Scott et al. 2003.

range between 0 and 34 percent after defecation and 3 and 37 percent after cleaning up a child.[11]

This paper focuses on handwashing promotion intervention, which attempts to improve child health by changing this key hygiene-related behavior rather than by implementing large and costly infrastructure investments in water supply or sanitation. In particular, we analyze the Global Scaling Up Handwashing Project in Peru, a large-scale intervention that aims to generate and sustain handwashing with soap behavior at critical junctures among mothers, caregivers, and children up to 12 years old in rural households. By trying to change the underlying factors that determine handwashing behavior (such as knowledge, beliefs, and accessibility of soap and water) among the target population, which is expected to result in improved handwashing behavior, the program tries to disrupt the causal chain that links poor hygiene with parasitic and microbiological disease transmission and thus ill health in children. Thereby, the study focuses on the following relevant outcomes: exposure to the intervention, changes in determinants of handwashing behavior (knowledge, beliefs, and access to/placement of soap and water), handwashing behavior (self-reported and observed), environmental contamination, and child health. To measure these behaviors and outcomes, we combined different quantitative and qualitative data collection techniques, including detailed questionnaires, structured observations, microbiological analysis of samples of children's stools, capillary blood, and drinking water collected in the field, and anthropometric measures performed by health experts.

The Global Scaling Up Handwashing Project in Peru intervention consisted of two main components:

- a province-level mass media campaign; and
- a more comprehensive district-level community treatment that included, in addition to the media campaign, training of community agents; capacity building of mothers, caregivers, and children; and the inclusion of handwashing promotion as part of primary school curricula.

[11] World Bank 2005.

The project also included supportive activities such as partnership building and policy reform that aimed to create an enabling environment capable of inducing and sustaining appropriate handwashing behavior. This study does not evaluate these enabling environment activities, but focuses exclusively on the effect of the mass media campaign and community treatment.

The results of this evaluation show that the mass media intervention alone was not effective in reaching the targeted population with the handwashing messages and therefore failed to improve knowledge and beliefs of mothers and caregivers regarding appropriate handwashing, or to generate a behavior change that could improve child health. However, the district-level interventions also analyzed in this paper proved to be effective in reaching the targeted audience with handwashing promotional messages. The community-level treated group was 19.4 percent more likely to report having received the intervention messages through at least one communication channel than the control group. Handwashing campaigns and promotional events at the community level and one-to-one activities seemed to have successfully transmitted the importance of handwashing with soap. Not only did the message reach the treated population, but it also improved caregivers' knowledge about the best way to wash hands by 6 percent**,** and increased the availability of soap and water in the household by 8.4 percent**.** These improvements led to a statistically significant increase in self-reported and observed handwashing with soap before food contact as compared to the control groups. However, this behavior change did not translate into better child health. No significant impact was found on parasite and bacterial prevalence in stools and drinking water (respectively), which is consistent with the fact that there were no treatment effects on diarrhea, nutrition, or anemia.

These results are consistent with previous studies in the literature of randomized handwashing promotion campaigns, which typically find that handwashing does reduce diarrhea in children under five years old, but those campaigns usually require intensive and controlled interventions. For example, Ejemot et al.[12] reviewed 14 randomized trials, concluding that handwashing programs resulted in a 39 percent reduction in diarrhea

[12] Ejemot et al. 2009.

episodes in children residing in institutions in high-income countries and a 32 percent reduction in such episodes in children living in communities in low- or middle-income countries. The authors suggest that the significant reduction is comparable to the effect of providing clean water in low-income areas. However, the community or institutional interventions studied required a high cost of monitoring and implementing and hence these authors (Ejemot et al. (2009)) conclude that larger scale and less demanding pilots should be performed in developing countries. Luby et al.[13] also showed that handwashing with soap reduces the incidence of acute respiratory tract infections, as well diarrhea, as a result of implementing an intensive and small-scale community-level intervention.[14]

Others have studied school-level interventions. Bowen et al.[15] evaluated a school program in China, in which 87 Chinese schools were randomized to a handwashing program that included training for teachers, in-class sessions, encouraging handwashing at school, and a pack for the children's families that included soap; or to an expanded intervention (handwashing program, soap for school sinks, and peer hygiene monitors).[16] They found that

[13] Luby et al. 2005.

[14] Luby et al. (2005) studied the causal impact of handwashing with soap in child health through a randomized control trial in Pakistan. Fieldworkers visited households weekly for a year to encourage handwashing with soap by residents and to record symptoms in all households. The authors found that children younger than 5 in households that received soap and handwashing promotion had a 50 percent lower incidence of pneumonia, and children younger than 15 had a 53 percent lower incidence of diarrhea than the children in control households.

[15] Bowen et al. 2007.

[16] Bowen et al. (2007) evaluated the Procter & Gamble's Safeguard promotion program. Teachers presented the program to first-grade children during a single 40-minute classroom session. Children were instructed in handwashing behavior and asked to wash their hands before meals and after using the toilet. The program included a single two-hour training session for each first-grade teacher by Procter & Gamble staff and provision of a teacher's pack, animated videotape for classroom use, and a take-home pack for each student. The teacher's pack contained a guidebook outlining five handwashing steps (wet hands, lather fingers, lather palms and backs of hands, rinse, and dry with a clean towel) and basic information about infectious disease transmission. It also contained five posters describing handwashing procedures and five wall charts designed for classroom hygiene competitions. The student take-home pack included a hygiene board game, a parents' booklet about handwashing, and a 50-gram bar of Safeguard soap. Although no significant differences in symptoms were found among in-class illnesses, absence incidence decreased in 44 percent for the standard intervention and in 42 percent for the extended treatment. The decrease in days absent was statistically significant only for the extended treatment (decrease of 52 percent). Syndrome-specific absence incidence also differed between groups: students in the standard intervention group were less likely than control students to be absent due to fever and students in the expanded intervention group were less likely to be absent due to headaches or stomachaches than the control students.

the expanded intervention significantly reduced syndrome-specific absence incidence (absence due to stomachaches or headaches).

To the best of our knowledge, the studies that so far have found handwashing programs to have significant effects on child health have focused on interventions that impose controlled conditions in small populations over short time periods. These studies are akin to efficacy trials in drug development, which evaluate the impact of a specific intervention under ideal conditions. In most published handwashing studies, the participants are visited each week over a period of months. This style of intense promotion can cause important behavior changes that we would not necessarily expect under non-study conditions where interaction with handwashing promoters is less frequent. Thus, although intensive handwashing interventions have proven effective in reducing diarrhea and acute lower respiratory infections (ALRIs), it has not been proven that similar results could be obtained if those interventions were implemented at scale. This paper, however, studies the effectiveness of a national handwashing campaign to learn the impacts of large-scale handwashing interventions in a real-world context.

Thus, this paper is the first to assess the effect of a large-scale handwashing intervention on a wide range of health indicators. Furthermore, to the best of our knowledge, we are also the first to study other intermediate outcomes, such as the campaigns' effectiveness and behavior change, which provides important insights on the full theoretical causal chain of disease transmission and ill health.[17]

The rest of the paper is organized as follows. Section 2 details the program components. In section 3 we explain the experimental design. Section 4 describes relevant issues concerning the data and sampling procedure and presents some descriptive statistics. Section 5 describes the results of the baseline balance checks and provides an analysis of the panel sample attrition. Section 6 describes the methodological framework. In section 7 we show and interpret the main results of the interventions. Section 8 concludes.

[17]See Cattaneo et al. (2009) for another example of a study of the causal path of an intervention on child health. In this case, the authors studied the effect of improving the floor of houses with cement.

2 Background and Description of the Program

In response to the preventable threats posed by poor sanitation and hygiene, the Water and Sanitation Program (WSP) launched two large-scale projects in December 2006—the Global Scaling Up Handwashing Project and the Global Scaling Up Rural Sanitation Project—to improve child health and welfare outcomes of rural households around the world. These projects were implemented by local, regional, and national governments, with technical support from WSP.

The Global Scaling Up Handwashing Project implemented in Peru, Vietnam, Tanzania, and Senegal, borrowed from commercial and social marketing to promote better hygiene. Communication campaigns and messages developed for this project were designed and strategically delivered across multiple integrated channels and in various settings in order to "surround" target audiences with handwashing promotion. Formative research conducted during 2007 with mothers and caregivers revealed that soap was not available for handwashing in most households in Peru, that there was a common belief that washing hands with water was sufficient, and that people did not know the critical times to wash hands with soap. In fact, the results of the structured observations in the baseline showed that soap was used in only 16 percent of the events in which it would have been necessary, that 20 percent of people were observed to wash their hands after fecal contact,[18] and that 25 percent of people washed their hands before eating.[19] Thus, the programs studied had sufficient scope to improve the hygiene habits of the treated households. These rates of soap use are lower than the observed rates in more developed peri-urban areas (47 percent after cleaning up a child in Northern England[20]) and higher than the rates observed in poorer countries (10 percent after cleaning up a child in Nigeria, 3 percent after defecation in Ghana, or 1 percent in after toilet use in urban Burkina Faso[21]).

[18]Fecal contact includes defecation, toileting of any kind, and cleaning a child who has defecated.

[19]At the baseline, structured observations of handwashing behavior were conducted in Peru as part of this study, in a subsample of 159 households (see Galiani and Orsola-Vidal 2010).

[20] Curtis et al. 2003.

[21] World Bank 2005.

In Peru, the Global Scaling Up Handwashing project was a national intervention implemented in a total of approximately 800 districts randomly selected (in 104 provinces). The project's primary target audience consisted of mothers of reproductive age (15 to 49 years), caregivers of children under five years old, and children up to 12 years old. The project's main objective was to improve handwashing behavior among the target audience in order to better the health of children under five. Children under five are the most susceptible to serious consequences from diarrhea and respiratory infection. These infections are usually transferred from dirty hands to food or water sources, or by direct contact with the mouth. Diarrheal disease and respiratory infection among children under five can be prevented by their mothers/caregivers washing their hands with soap at critical times, such as before feeding a child, cooking, or eating, and after using the toilet or changing a child.

The intervention comprised two main components that were delivered at different administrative levels: a mass media plus direct consumer contact treatment at province level, and a community treatment at the district level. The activities included under each component of the project are as follows.

2.1 Province-Level Intervention: Mass Media plus Direct Consumer Contact Treatment

A mass media plus direct consumer contact (DCC) communication campaign was implemented at the provincial level. Because research conducted before project implantation revealed that most people did not use soap when washing hands and that many mothers and caregivers thought using soap was not necessary, the communication strategy focused on the issue of nonuse. The campaign emphasized the importance of the availability and use of soap for handwashing, and the need to wash hands with soap immediately before cooking or eating and after fecal contact (going to the bathroom and changing a baby).

The mass media plus DCC campaign targeted mothers, caregivers, and children, and the main communication channel was broadcast radio. Radio spots, lasting between 30 and 50 seconds each, were aired from five to nine times daily during the months of September to December

2009, April to June 2010, and August to November 2010.[22] The campaign also included print materials such as posters with reminders of key junctures in which to wash hands with soap, comic books, and brochures featuring a superhero cartoon character *(Super Jaboncin*) created especially for the campaign. Additionally, promotional events such as street parades, games, and local theater performances were conducted in public spaces, where *Super Jaboncin* came to life to promote handwashing and the use of soap. The jingles developed for the radio spots were used as the events' background music, ensuring that the target audience received the same messages from multiple channels. On average, the events lasted from two to three hours and had audiences of 100 to 1,000 women and children.

2.2 District-Level Intervention: Community Treatment

The community (or community and school) intervention was conducted at the district level and consisted of:

- a mass-media plus DCC campaign;
- training of trainers of community-based agents of change such as teachers, medical professionals, and community leaders;
- capacity building and provision of educational handwashing sessions for mothers, caregivers, and children; and
- handwashing curricula in select primary schools.

With all these activities, the community intervention aimed to achieve an integral and sustainable change through different actors and channels.

The communications campaign included broadcast radio advertisements with the same messages and frequencies described in the province-level treatment, and print materials such as posters with reminders of key junctures in which to wash hands with soap. It also included print materials featuring *Super Jaboncin*, the superhero cartoon character developed for the campaign. As part of the communications strategy, the community activities were intentionally tied to the handwashing promotional events. The events took place in different

[22] According to the baseline survey held for this study, 79 percent of the households had a radio, CD, or cassette player (see Appendix 1 for more information on household assets).

venues in the district and the audience might have been different each time or some people might have attended several events.

In addition to the communication campaign, the community treatment included handwashing education sessions with groups of mothers, caregivers, and children. During these handwashing sessions, community-based agents, trained for such a purpose, demonstrated how to properly wash hands with soap, explained the critical junctures in which we must wash our hands with soap, and provided information on the extent to which improved handwashing behavior impacts infant health and welfare. The specialists in charge of conducting the handwashing promotional sessions included schoolteachers, health promoters, and local leaders who were trained as part of the community treatment to play a mediating role in influencing mothers', caregivers', and children's handwashing behavior.

In the districts that received the community treatment, a school-level treatment was delivered to the main primary schools in each district. In these schools, handwashing behavior was introduced as part of the school curricula. The activities included designating a place in the classroom for soap, performing regular handwashing practices in groups each day, weekly handwashing promotion classes, and other children's activities such as singing songs and drawing posters. This school component of the community intervention tried to transmit the handwashing message to households of children attending the treated schools by including handwashing education in their formal studies.

These components were implemented by national, regional, and local governments. The Water and Sanitation Program (WSP) provided technical assistance, but the intervention was mainly conducted by public and private partners who integrated these activities into the governments' ongoing projects.[23]

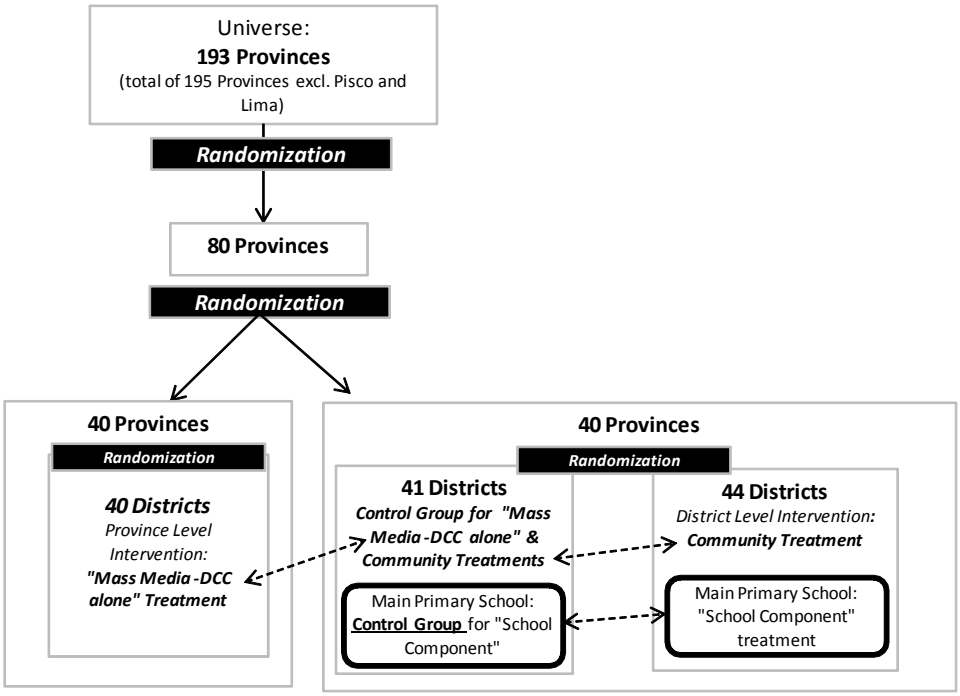
[23]The Global Scaling Up Handwashing Project also included additional activities that were not evaluated as part of this study. These activities involved partnership building between public and private agents, capacity building of government entities, and policy reforms. These activities aimed to create an enabling environment that facilitated and sustained handwashing behavior with soap. These activities were assessed separately and the results published in a different study (Favin 2011).

3 Evaluation Study Design

Estimating the causal relationship between the treatment and the outcomes of interest requires the construction of an accurate counterfactual—that is, a comparison group that shows what would have happened to the treatment group in the absence of the intervention. To account for factors external to the intervention, counterfactuals are created using comparison groups (control) that are equivalent to the treatment group on every dimension (observed and unobserved) but the treatment. Because a good counterfactual approximates what would have happened to the treatment group in the absence of the treatment, any differences in the average outcome measurements of the treatment and control groups following the implementation can be understood as the causal effect of the intervention. The randomization process, by which a random selection of communities receives the treatment and the remaining serve as controls, generates an appropriate counterfactual for the purposes of the impact evaluation.

Thus, to assess the causal impact of each of the project components on a set of relevant variables, we conducted a controlled randomized trial comprising the province-level treatment as well as the district-level intervention, taking into consideration the general community treatment and its school component.

Figure 1: Design of the Experiment



The targeted areas were districts with populations ranging from 1,500 to 100,000 inhabitants. Figure 1 shows the experiment's design. First, Pisco and Lima were excluded from the 195 Peruvian provinces.[24] From the 193 remaining provinces, 80 provinces were randomly selected, with 40 assigned to a first group and 40 to a second. From the first group of 40 provinces, 40 districts (with between 1,500 and 100,000 inhabitants) were randomly chosen to receive the mass media province-level treatment. From the second group of provinces, 85 districts (with between 1,500 and 100,000 inhabitants) were randomly selected, with 44 randomly assigned to receive the district-level community treatment and the other 41 randomly assigned to serve as control group for the mass media and community treatments.[25] In addition, for the 44 districts that were randomly assigned to the community treatment, the main school in each district received the school

[24]The province of Pisco was excluded because an earthquake had just hit the area. The province of Lima was excluded because most of its districts were too large for this type of intervention (more than 100,000 inhabitants), and its inhabitants were relatively wealthy.

[25] Note that because every district had the same probability of being selected for the evaluation, small, poor districts were overrepresented in the sample. This was desired, however, given that the program was targeted toward the poor.

treatment. To create a counterfactual for the subgroup of households with children attending the main school in the treated districts, we also chose a subsample clustered around the main schools in the districts of the control group to serve as a control group for the school intervention.

In what follows we assess the impact of the two treatments: mass media and community on a wide range of outcomes and we also study separately the school level component in the community intervention. We will refer to the households employed to explore the community treatment as *community sample* and to the households used to investigate the school component of the community treatment as the *school sample*.

4 Data Collection

We conducted baseline and follow-up surveys. The baseline survey was conducted from May through August 2008 in a total of 3,576 households. The follow-up took place four months after the project activities ended—from March through June 2011. We located 2,847 of the original households interviewed for the baseline survey during the follow-up round. We replaced the households we could not find with new households that fit the following criteria: the family had lived in the dwelling for at least the two previous years (e.g., when the intervention took place) and had a child under two years of age at the time of the baseline survey.

For the household-level sampling, in each of the 125 districts allocated to treatment and control groups, we randomly selected between 15 and 20 households from a census conducted prior to our baseline survey that listed all households with children under two years of age. From the 44 districts assigned to the community treatment, we randomly selected an additional set of 15 to 20 households with children under two years old and with at least one sibling attending the main treated schools in each district to assess the effect of the school subcomponent of the district-level intervention. To serve as counterfactual for this last group, in each of the 41 districts allocated to the control group, we randomly chose a second set of 15 to 20 households with children under two years old

and with at least one sibling attending a school similar to the main treated school in the treatment districts.

Imasen, a local survey firm, conducted data collection together with a local institution specializing in nutrition (*Instituto de Investigation Nutritional*). The surveys were performed by more than a dozen teams, each consisting of a field supervisor, anthropometric and biometric technicians, household enumerators, and an observer for structured observations. All field team members received extensive training and followed standardized protocols supervised by the project's investigators to ensure accurate and consistent data collection.

4.1 Variables of Interest and Measurement

Data were collected on a wide range of variables and from different sources. First, a comprehensive household survey inquired about dwelling characteristics, household assets, education, income, labor outcomes, water sources, sanitation, and toilet and handwashing facilities, among other relevant variables (see Appendix 1 for the complete list). Also included were questions on exposure to handwashing campaigns, determinants for handwashing behavior—handwashing knowledge, beliefs, and access to and placement of soap and water—and caregiver self-reported handwashing behavior. To complement the handwashing behavior module, structured observations, during which the family's handwashing behavior within the household was observed for four to five hours, were conducted on another day following the survey. During that period, the interviewer noted in detail any handwashing event involving adults and children during her stay.[26] In addition, to measure environmental contamination, drinking water microbiology samples were collected inside the households at the time of the survey and analyzed in the field using a membrane filtration technique. The samples were analyzed to determine the presence of *Escherichia coli* and other types of coliforms.

To assess the household situation with regard to children, caregivers were given a detailed questionnaire with questions about the child's environment, maternal depression, the

[26] Structured observations were only carried out for the treatment and control samples of the school treatment.

relationship between family and school, and child health. We were mostly interested in symptoms directly or indirectly related to poor handwashing habits. We asked about diarrhea and ALRI prevalence in the last 48 hours and in the last week. Both illnesses are mainly transmitted through the hands—that is, the hands constitute disease vectors carrying respiratory microorganisms and fecal material.[27] We also performed anthropometric measurements of children following standard international procedures, because the synergistic relationship between malnutrition and infection is usually exacerbated in diarrheal episodes given that children tend to eat less during episodes and their ability to absorb nutrients is reduced.[28] These measurements helped us detect the children's nutritional situation.

A more detailed assessment of the presence of intestinal parasitic infestations in children was achieved by the laboratory analysis of children's stools. Stool samples[29] were also collected during the interviews in duplicates and sent to Lima for parasitical analysis, using quantitative eggs per gram estimates of soil transmitted helminthes, quantified using Kato-Katz microscopy tests. We registered the prevalence of parasites and the parasite count in stool samples of children under five years of age.

Parasitic infestations pose serious threats to young children's health because the associated diarrhea and micronutrient malnutrition often leads to iron-deficiency anemia.[30] We therefore also measured anemia in children between six months and five years of age. Health specialists analyzed hemoglobin concentrations from the children's capillary blood using the HemoCue Hb 201 photometer, a portable device that allows for immediate and reliable quantitative results.

[27] Hendley et al. 1973; WHO 2003.
[28] WHO 2003.
[29] Stool samples were collected only for children under five years of age in the treatment and control groups of the school treatment.
[30] See, for example, Hesham et al. 2004.

4.2 Descriptive Statistics

Peru is a middle-income country with an estimated per capita income of US$5,195 in 2010.[31] Peru has a high human development index (HDI) score of 0.725 based on 2011 data (the index for Latin America and the Caribbean is 0.731 and for the world is 0.682).One-third of the population is poor (31.3 percent) and 9.8 percent is extremely poor.[32] The wealthiest region of the country is Lima, Peru's capital city, which is excluded from this study. The mean years of schooling for adults older than 25 is 8.9 years and is increasing over time. Most of the children attend school (93 percent primary school and 76 percent high school) according to 2010 data.[33]

According to the baseline survey, the households analyzed averaged 5.3 members, with 1.4 children under age five.[34] Around one-half of household heads had attained secondary education and most (95 percent) were employed. The average monthly household income per capita was 140 Peruvian nuevos soles (around US$ 54). The population included in the study was poorer on average than the population of Peru, given that poverty is concentrated in the small districts and that we sampled families with at least one child under two years old.[35]

Three-quarters of the households had access to improved sources of drinking water, whereas half of the households had improved sanitation. More than 20 percent of all households had no sanitation facilities of any type.

Handwashing with soap behavior was not prevalent among the interviewed households. Although almost all caregivers report having washed their hands with soap at least once during the previous 24 hours, fewer than half confirmed having done so at times of fecal contact (46 percent of caregivers associated handwashing with soap with toilet use and 42 percent with cleaning up children). Self-reported handwashing with soap was higher at times of cooking or food preparation (68 percent), but lower when feeding a child (34 percent). Structured observations on the use of soap were substantially lower than self-reported rates.

[31] IMF 2011.
[32] INEI 2012.
[33] INEI 2012.
[34] For the complete list of variables analyzed, see Appendix 1.
[35] Indeed, the average household in the evaluation sample is poorer than the average Peruvian household (see Galiani and Orsola-Vidal 2010).

Handwashing with soap was only observed in 16 percent of the events that required it. For instance, handwashing with soap was observed in only 20 percent of fecal contact events, 25 percent of eating events, 6 percent of child feeding events, and 10 percent of food preparation events.[36]

In 64 percent of the households, a handwashing facility—a designated place for handwashing—stocked with soap and water was observed within the dwelling or the yard. The higher the income, the closer the handwashing station was to the toilet or kitchen facility. More than half of the caregivers (53 percent) appeared to have clean fingernails and approximately 67 percent had clean hands or finger pads, whereas 75 percent of the children appeared clean at the time of the interview but 47 percent had dirty fingernails. Households with access to improved sanitation and water source presented lower counts of bacteria in their drinking water. When accounting for income levels, there was a declining trend of Escherichia coli (E. coli) counts with increased income[37].

Parasitological analysis showed that on average, parasites were detected in 12 percent of the stool samples collected from children under two (the most frequent were Giardia and Blastocystis). Prevalence of parasites was lower among households with access to improved sanitation (7 percent) and water (8 percent) than those with unimproved sanitation (18 percent) or unimproved water (25 percent). The lowest prevalence of parasites was found in households with a handwashing station stocked with soap and water (3 percent) and highest in those without (29 percent).

Concerning child health, 10 percent of children under the age of five were reported by their caregivers to have had diarrhea symptoms in the previous 48 hours and 18.4 percent in the past seven days. Prevalence of diarrhea was higher in households with unimproved sanitation (12 percent) and lower for those with improved sanitation (8 percent); however, diarrhea prevalence was not significantly lower in households with access to a handwashing station

[37] For a subsample of 159 households, we also analyzed samples from sources other than drinking water. Households with access to improved sanitation also presented lower counts of bacteria in hand rinse and on sentinel objects. Water and caregivers' hand rinse samples from households with a handwashing station with soap and water had lower bacteria counts (see Galiani and Orsola-Vidal 2010).

with soap and water nor in households with access to improved water sources, compared to those without access. Diarrhea prevalence appeared to be uncorrelated with income, but it varied noticeably by geographic location. On average, 4 percent of children had presented ALRI symptoms in the previous 48 hours, and 6 percent in the previous seven days. ALRI prevalence increased for children living in households with unimproved sanitation and those with unimproved water sources. As with diarrhea, similar percentages of households had presented ALRI symptoms in the previous seven days, irrespective of whether they had a handwashing station stocked with soap and water. In addition to these, three-quarters of the samples taken from children younger than two years old indicated the presence of anemia (the proportion was slightly lower for households with improved sanitation).

Finally, the average child was breastfed for 12 months, although more than 60 percent of caregivers gave their children instant formula during the first three days of life. Vitamin A was given to 23 percent of the children and iron supplements to 22 percent. On average, children living in dwellings without improved sanitation, an improved water source, or soap and water at a handwashing station tended to have a lower average z-score for each anthropometric measure included in the analysis as well as for child development indicators (including communication, social-personal, and gross motor skills).

5 Balance and Attrition

5.1 Baseline Balance

Random assignment of the study participants to treatment and control groups ensures that in probability the groups will be similar in their observable and unobservable characteristics. In this section we check that the randomization was performed adequately, resulting in comparable groups.

Appendix 1 shows the mean comparison tests[38] across treatment/control groups for an exhaustive set of variables included in the baseline survey. We compare the characteristics

[38] The standard errors used in those tests were clustered at the district level, allowing the possibility of intradistrict correlation.

of households allocated to each treatment with the households of the corresponding control groups. We test for differences in a wide range of variables including socio-economic characteristics, dwelling facilities and materials, household assets, children's situation (education, health, nutrition, cognitive development, childcare, and the relationship between family and school), and many variables directly or indirectly associated with handwashing habits. We obtained the variables reported through questionnaires, microbiological analysis of samples (drinking water and child stools), anthropometric measurements, and capillary blood sample of children (for anemia).

The province-level mass media treatment and control comparison used more than 242 variables; in 39 (16.1 percent) of them, we rejected the null hypothesis of mean equality at the 10 percent significance level. This proportion is slightly lower for the district-level intervention: for the community treatment sample, 30 of 242 (12.4 percent), and for the school treatment sample, 29 of 251 (11.5 percent) were unbalanced at conventional significance levels.[39] The larger proportion of statistically significant mean differences in the mass media treatment could have been expected given that the randomization was at province level for this intervention, unlike the district-level randomization within the same provinces for the community treatment samples. One would expect to find less significant differences among districts within the same group of provinces than among districts in different provinces.

The differences between treatment and control groups go in either direction without a clear pattern. The only apparent difference is that the control group for the mass media province treatment appears to perform better in terms of improved sanitation than the treatment group. However, the opposite occurs when comparing the school treatment sample.

[39] The proportion of unbalanced variables is close to the standard of 10 percent usually acceptable in randomized experiments. It is important to note, however, that the variables measured are not independent (probably neither the balanced nor the unbalanced ones).

5.2 Attrition Analysis

An important concern for any impact evaluation is the fact that participants sometimes drop out of the study before its completion. Our baseline and endline survey records show an overall attrition rate of 20 percent after three years. This rate is in line with the attrition rates found in other similar randomized studies of this type.[40] In addition to the fact that sample size is reduced, when attrition is systematically related to the outcomes under study or to the program itself, it can bias the estimates of the causal effects of the interventions studied. We followed the standard procedures in the impact evaluation literature to address this potential problem.

First, we explored whether the attrition rates differed between the treatment and comparison groups for each of the interventions studied. As Appendix 2 shows, the proportion of households that stayed in each group ranges from 0.72 to 0.84, and we cannot reject the null hypothesis of equal level of attrition in the control and treatment groups at conventional significance levels in any of the samples studied.

The fact that there was no differential attrition in the treatment and comparison groups is consistent with the hypothesis that attrition is ignorable, and it suggests that the estimate of the treatment effects will not be biased unless different types of households dropped out of the sample in the treatment and the comparison groups.[41] For example, if households with healthier children were more likely to drop out when they were assigned to the treatment group, this could bias the estimator of the program effect on health outcomes downward. Fortunately, this does not seem to be the case in our study. Baseline balance was achieved for the entire initial sample in most of the variables (see Appendix1), and in Appendix 2 we can see that baseline balance is also high for a set of variables for the non-attriters' sample. This implies that those remaining in the sample and the attriters were balanced in terms of observable characteristics.

[40] For example, Banerjee et al. (2007) find attrition rates of 17 and 18 percent, respectively, in the comparison and treatment groups in Vadodara (India) in the first year when they evaluated *Balsakhi* education program in India.

[41] Angrist 1996

To make up for the loss in sample size due to attrition, we included 688 new households in the follow-up survey to replace households that dropped out. To confirm that the characteristics of the replacement households were balanced between treatment and control groups, we selected 32 variables that were presumably independent of the treatment and affected by more structural patterns (e.g., the dwelling's characteristics). In most of them, we could not reject the null hypothesis of equality of means at conventional significance levels (see Appendix 2).

6 Methodology

The treatment assignment in this study was random and, as shown in section 5, the randomization produced comparable groups in terms of observables for all the groups studied. Furthermore, the results of the previous section suggest that attrition is unlikely to bias the experiment's results. Therefore, in the context of this randomized experiment, we can obtain the average treatment effect on the outcomes of interest by estimating the following simple regression model:

$$Yi = \alpha + \gamma Ti + \beta Xi + \varepsilon i \qquad (1)$$

where i indexes households or individuals, Y is any of the outcomes under study, T is the dummy variable indicating treatment assignment (equal to one for units in treated groups), γ is the parameter that captures the causal effect of the intervention considered on the outcome of interest (Y), X is a vector of control variables, and ε is the error term. We estimate robust standard errors clustered at the district level in all the analysis.

The vector X comprises the following control variables: gender and education of the head of household, dummy variables for children's ages in months, gender of children, an indicator variable for mother living in the house, rainfall[42] (at district level) and geographical dummies for region (jungle, coast, and mountain).

[42] Rainfalls are measured as the maximum rainfalls per district, averaging January, February, March, and April 2011.

The results presented throughout the paper are estimates of model (1). The results are robust to two alternative models: dropping all the control variables and dropping only the geographical dummies. In Appendix 3 we present the results for the three models as robustness checks.

7 Effects of the Global Project in Peru

In this section we present the results for both the province-level and district-level interventions. We present the results following the relevant outcomes of the hypothesized causal chain: exposure to handwashing promotion, effects on handwashing determinants (handwashing knowledge and beliefs, and access to and placement of soap and water), handwashing behavior (self-reported and observed handwashing and hand cleanliness), environmental contamination (bacteria prevalence in drinking water), and child health (prevalence of diarrhea, ALRI, anemia, parasites in stools, nutrition, and anthropometric measures).[43]

In addition to assessing the impact of the mass media and community interventions on the mentioned outcomes, we are interested in studying the effect of the school handwashing curricula component, which is part of the community intervention, separately. Thus, in Tables 1–5, "community treatment sample" refers to the sample of households employed to explore the comprehensive community treatment, and "school component sample" refers to the households sampled to investigate the community treatment's school component. In the remaining of the paper, we will use *school component* and *school treatment* interchangeably.

7.1 Exposure to Handwashing Promotion

The Global Scaling Up Handwashing Project in Peru uses a behavior change approach; therefore, to expect any project impact, the campaign and its messages must reach the target population. Thus, we asked mothers and caregivers whether they had received handwashing

[43] We do not pursue the study of child development outcomes because the health results suggest that those could not be causally interpreted as a response to the interventions studied.

promotional messages during the past 12 months, through any of the three channels used by the intervention: radio and printed materials, promotional events, and educational sessions.

As Table 1 illustrates, the province-level mass media plus DCC treatment did not increase the exposure of the treated households to the handwashing promotion message through any of the channels proposed. Thus, starting with this finding, we do not expect to find any other causal effect that could be attributed to the mass media province-level intervention.

The district-level intervention (mass-media plus DCC, and community treatment) was considerably more successful in exposing the target audience to the handwashing with soap message. The random sample exposed to the community-level treatment was the most affected as a result of this intervention, as the proportion of mothers or caregivers that reported having received handwashing messages through at least one (two) of the communications channels was 15.7 percent (33.5 percent) higher in the treatment group than in the control group.[44]

We are also interested in assessing whether the messages imparted at schools reached the attending children—even though those children and their mothers/caregivers might also have been exposed to the other community-level activities. Table 1 shows that the school component increased the probability of low exposure to the treatment (that is, receiving the messages through one channel) by 8.9 percent. To compare this result with that of the community treatment, notice that the households in this treatment group have at least one child attending the school. These households are located in districts also affected by the community treatment, but because they are clustered in a certain area (around the main primary school), their probability of receiving the handwashing message through the other promotional activities in the district might be lower than the probability of receiving them for a random household in the district.

[44] Note, however, that the control group also reports high levels of exposure to similar messages. Although this might partially reflect measurement error, it might also reflect the fact that other, less intensive campaigns could have been implemented elsewhere.

7.2 Treatment Effects on Handwashing Determinants

Improving handwashing behavior requires changing the factors that motivate that behavior. These factors are known as *handwashing determinants*, and include knowledge about the best way to wash hands, beliefs about whether soap is needed for effective handwashing, and the availability and placement of soap and water. Caregivers were asked about their knowledge of effective handwashing habits as well as the availability of water or soap in the household. This would constitute the second link—after exposure to information—in understanding whether the project could lead to a behavior change.

Table 2 shows that the mass media plus DCC treatment was ineffective in improving the knowledge of the survey respondents or in increasing the availability of soap and water in households. This result is expected given that respondents did not show a higher exposure to the handwashing promotion campaign. Table 2 also shows that the district-level interventions increased not only the exposure to the treatment, but also the knowledge of mothers and caregivers regarding handwashing practices. For instance, in the treated districts, there was a significant (around 5 percent) increase in the proportion of respondents answering that the best method for washing hands is using water and soap. In addition, 3.3 percent more households in the treated districts knew that inadequate handwashing is the main cause of diarrhea.

It is important to note that the mean of the control group for these knowledge variables is high: 88 percent of the caregivers answered that the best method for washing hands is with water and soap and 94 percent of the interviewees claimed that inadequate handwashing is the main cause of diarrhea. In these variables, we observe a modest gap of 12 and 6 percentage points, respectively, to total knowledge. If we measure the effect of the community intervention in terms of closing the knowledge gap, we can see that the program reduced this gap by as much as 50 percent (the gap on knowledge regarding the best method for washing hands was reduced by 42 percent and the gap about how inadequate handwashing can cause diarrhea was reduced by 50 percent).

Finally, the community treatment increased the availability of water and soap in households by 8.4 percent (among the school component sample). Again, it is worth mentioning that

availability of soap and water anywhere in the dwelling is also high in the control group (e.g., 77 percent of the households in the control group for the school component of the community treatment have water and soap somewhere in the dwelling). Thus, the treatment reduced the gap by 28 percent, which constitutes remarkable progress.

7.3 Treatment Effects on Handwashing Behavior

The next step in the causal chain is assessing whether the improvements in handwashing knowledge and the availability of water and soap brought about by the community treatment translated into handwashing behavior changes.

Measuring handwashing behavior is complex. The simplest and most affordable method for measuring handwashing with soap is to ask respondents to self-report their behavior. However, respondents tend to over report their behavior, especially if they know that handwashing with soap is the right thing to do. Ideally, multiple methods should be used to obtain a more reliable rate of true handwashing behavior. This study uses four different measurement methods and proxies that vary in validity, reliability, and cost to obtain accurate rates of handwashing behavior.[45] These measures include observation of handwashing facilities in the households, cleanliness of caregivers' hands, self-reported handwashing with soap behavior, and direct structured observations of handwashing. Table 3 summaries the results for these four measures.

Observations of handwashing facilities were conducted in all households. The mother or caregiver was asked to identify any place in the household designated for handwashing after fecal contact or before food contact.[46] When the answer was positive, the enumerator noted all the details about the handwashing facility, including the facility type, its distance from the toilet or kitchen, the availability of water and soap, and the type of soap. At baseline, the proportion of households with at least one handwashing facility near the toilet or kitchen was quite high (66 percent). The community treatment increased the share of households with

[45] Ram 2010

[46] Fecal contact includes using the toilet and cleaning a child's bottom; food contact includes food preparation, eating, or feeding a child.

handwashing facilities by 4.9 percent (9.2 percent for the school component sample), but the increase was not statistically significant at conventional levels of significance. The enumerators also observed the hands of mothers and caregivers and recorded the cleanliness of their nails, palms, and finger pads. These observations were used to create a Hand Cleanliness Index.[47] The district-level intervention had a positive and significant effect on the hand cleanliness of mothers, as respondents in the community treatment group were 3.6 percent more likely to have clean hands than those in the control group.

Self-reported handwashing behavior was measured by asking mothers and caregivers under what circumstances they had washed their hands with soap in the previous 24 hours. Respondents were asked to recall every time they had used soap during handwashing. Analysis of the responses focused on self-reported handwashing with soap behavior during any of the critical junctures. As Table 3 shows, self-reported handwashing with soap behavior improved in the district-level interventions in almost all the critical junctures, but it was statistically significant only in the school treatment. Among the school component sample, 23.6 percent more respondents in the treatment group reported having washed their hands with soap before eating and 27.8 percent more reported having washed with soap before feeding a child, relative to the control group.

As mentioned earlier, self-reported handwashing behavior tends to be over reported, so in order to triangulate the results, the study included structured observations of handwashing in a subsample of 600 households. Direct observations were conducted among the school component and its control group during a 4-to-5-hour period on the day after the main questionnaire was administered. Enumerators in charge of the structured observations received extensive training on being discreet and not revealing that the visit's main focus was to observe handwashing behavior. The enumerators observed events that should be followed by handwashing and recorded whether the caregiver had actually washed hands, the time of the event, whether water and soap were used, whether hands were dried, and what was used

[47] The Hand Cleanliness Index comprises the following components: a) Nails: +1 if visibly dirty, +2 if apparently dirty, +3 if clean; b) Palms: +1 if visibly dirty, +2 if apparently dirty, +3 if clean; and c) Fingerpads: +1 if visibly dirty, +2 if apparently dirty, +3 if clean. The index ranges from 3 to 9, with higher scores indicating greater cleanliness.

for drying. Table 3 summaries the results of these structured observations. As the results show, the district-level intervention had a significant and large effect on observed handwashing in two of the four main critical junctures. In particular, 61 percent more households in the treatment group washed their hands with soap before eating than those in the control groups. Similarly, treated households were 69 percent more likely to wash hands before food preparation than nontreated households. These effects are encouraging with respect to the potential of the community intervention in achieving behavior change.

There is a possible caveat regarding the results of the structured observations, as individuals may have changed their behavior because they were observed. For instance, Clasen et al. show that during a field trial in India where they measured the number of latrine events with a device hidden in the latrine, the presence of a human observer was associated with a statistically significant increase in the number of latrine events (i.e., the users modified their behavior in response to the observer).[48] In the context of this handwashing campaign in Peru, that type of change in behavior would be true for both the control and the treatment group. However, rates of handwashing with soap as measured by structured observations are substantially lower than self-reported rates, so there does not seem to be a high overreaction to the observer. What could still bias our causal estimates is a situation in which the treated group would react differently in the observer's presence (probably showing better practices given that they received the handwashing message) relative to what they would do in the control group. If this were the case, our results still would confirm that the treated group had received the handwashing messages and knew when to practice handwashing with soap. Nevertheless, structured observations continue to be the gold standard in measuring handwashing behavior, and it provides a more reliable measure of true handwashing practices than self-reported rates. Thus, the results show that the community intervention was successful in achieving behavior change.

For the mass media provincial-level intervention, we found no negative effects, which are not likely to be attributed to the treatment, as its messages did not reach the targeted audience.

[48] Clasen et al. 2012.

7.4 Treatment Effects on Environmental Contamination

Medical evidence suggests that the transmission of diarrhea and respiratory infections is mainly through the hands, which constitute disease vectors carrying respiratory microorganisms and fecal material to the domestic environment of the susceptible child. The use of soap reduces germs and bacteria in hands, thus reducing the risk of becoming sick. It is expected that those practicing handwashing with soap at key junctures will have a lower presence of bacteria such as *Escherichia Coli* or total coliforms on their hands, thereby reducing the risk of contamination when handling, preparing, or serving drinking water at home. Thus, the study collected samples of drinking water[49] from a subsample of 600 households among the school component sample and its control group. These samples were collected during the administration of the questionnaire, and analyzed to detect the presence of *Escherichia Coli* and total coliforms. Consistent with previous results, the microbiological analysis of drinking water samples summarized in Table 4 shows that the prevalence of *Escherichia Coli* and of total coliforms was lower in the treated households than in those of the control group, but none of the effects are statistically significant at conventional levels.

7.5 Treatment Effects on Child Health

The last step in the causal chain is to assess whether the positive results found on exposure to the campaign—knowledge of appropriate handwashing practices, access to soap and water, and handwashing with soap behavior—resulted in health improvements. Table 5 summarizes the effects of the treatments in a wide range of indicators of child health and well-being, including symptoms of illness, nutrition, parasite infestations, and anemia. The results show that overall none of the treatments had a significant effect on those variables.

Because the mass media plus DCC provincial-level treatment alone had no effects on previous outcomes, we did not expect to find any impact on child health. If there were significant estimates, they would probably not be causally attributed to the treatment given that it did not reach the target audience (see Table 1). This is the case of a reduction in the prevalence of

[49] Drinking water is not the water at source, but rather the water that the household drinks directly. Drinking water can be boiled or treated and is usually stored in containers or jars inside the household.

ALRI. In the baseline, this variable was not balanced, as households in the control group were performing significantly worse than those in the treatment group. In the follow-up survey, the situation reverted but there are no grounds to think that it was the effect of the program. This suggests that in this specific health dimension the two groups might not be comparable and that respiratory diseases are influenced by regional temporary variability.

For the district-level intervention (community and school component samples), the improvement in knowledge and behavior change do not seem to have resulted in better health for the children. There are no statistically significant differences between the prevalence of diarrhea or ALRI among children in treated households and those not treated. Nor do we observe any important improvement in the anthropometric measurement[50] or anemia indicators. The prevalence of parasites and the parasite counts obtained from the stool samples (of children under 5 years old) are not significantly different in the control and treatment groups. These results are consistent with the fact that the treatments had no effect on diarrhea, micronutrient malnutrition, or anemia, as these health problems are usually related to parasitic infestations.[51]

8 Conclusion

Some simple technologies, such as vaccines and mosquito bed nets, are cheap and effective preventative measures that can save lives at minimal costs.[52] Handwashing with soap at critical times is another of these technologies: soap is generally easy to use, is relatively cheap, and has the potential of substantially improving the living standards of households. Despite these potential benefits, however, only 3 to 34 percent of people in developing countries routinely wash their hands with soap at critical junctures during the day.[53]

[50]The z-scores for the anthropometric measures were calculated discarding the lower and upper 1 percent of the distribution.

[51] Unfortunately, a disaggregation of the prevalence of different parasites shows extremely large variability, suggesting that making inference at that level of disaggregation could be unreliable. Nevertheless, we report finding large drops in the treatment group in the prevalence of any *Ascaris Lumbricoides* infections and any *Trichuris Trichuria* infections, no differences in Hookworm infections, but a significant rise in the treatment group in any other parasites infection.

[52] Banerjee and Duflo 2011

[53] World Bank 2005

Although medical evidence about the benefits of handwashing with soap is clear, changing handwashing behavior is a complex phenomenon related to personal habits that has multiple determinants (economic, cultural, social, etc.).[54] These characteristics of handwashing result in important difficulties in changing and sustaining these hygienic practices. This paper studies a large-scale handwashing promotion intervention that took place in Peru between 2008 and 2010, and that introduced an innovative mix of communication strategies to induce handwashing with soap at critical times. In particular, the study examined the effect of two different treatments—a province-level mass media campaign and a district-level community treatment—on several outcomes: exposure to the program, handwashing determinants, handwashing behavior, environmental contamination, and child health. We combined different quantitative and qualitative data collection techniques to measure these variables, including detailed questionnaires; structured observations; microbiological analysis of samples of child stools, capillary blood, and drinking water collected in the field; and anthropometric measures performed by health experts.

This paper is the first to assess the effect of a large-scale handwashing with soap intervention using such a wide range of indicators. Previous studies in the literature of randomized handwashing experiments focus on intensive (in terms of labor, inputs and/or monitoring) and controlled treatments, showing that they are effective in reducing diarrhea and pneumonia incidence in children.[55] This study, in contrast, examines a significantly less intensive intervention at scale under real-world conditions. In addition, we study a full set of intermediate outcomes, such as the effectiveness of the campaigns and behavior change, in order to better understand the results in the context of the causal path of disease transmission identified in the medical and public health literature. To the best of our knowledge, ours is the first study of handwashing to focus on all components of this causal chain.

The results of this evaluation show that the mass media intervention alone was not effective in reaching the targeted audience with the handwashing message and therefore failed to improve the handwashing knowledge of mothers and caregivers and to generate a behavior

[54] Chapman 2010
[55] Luby et al. 2005

change that could improve child health. The null results are in line with most of the existing evidence on health promotion campaigns, which typically show that they are ineffective in impacting behavior or that they, at best, enhance the knowledge about the promoted topic. (See, for example, Babor et al.'s work on alcohol prevention campaigns[56]; Madajewicz et al.'s work on arsenic in water in Bangladesh[57]; Banerjee and Duflo's work on vaccination campaigns in Zambia[58]; and Summerbell et al.'s work on obesity prevention campaigns[59]).

In contrast, the community intervention, which combined the mass media campaign with more intense training and promotional activities delivered at the district level, proved to be more effective in reaching the targeted audience with the handwashing promotion message, significantly increasing the proportion of mothers and caregivers that reported receiving it. The community treated group reported receiving the message at least through one communication channel more than 15 percent more often than the control group. This more comprehensive treatment seemed to have successfully transmitted the key messages related to handwashing with soap. Increased exposure to the campaign and educational sessions translated into observable learning about best handwashing practices. For example, the proportion of mothers and caregivers that responded correctly that the best method for washing hands is using water and soap increased significantly (around 5 percent) as compared to the control group. Considering the generally good levels of knowledge about this among sample households, this 5 percent change means that almost half the remaining gap in

[56] Babor et al. 2003

[57] Madajewicz et al. 2007. In this paper, the authors also compared two types of information campaigns and found that the more personalized treatment was more effective. People exposed to a media information campaign obtained as much information as those exposed to a door-to-door campaign, but they did not change their behavior regarding checking whether the dwelling where they obtained water was safe and moving to another dwelling if it was not. The authors also studied a personalized campaign that provided information specific to the individual (whether her/his well is safe and which wells in the vicinity are safe), achieving behavior changes.

[58] Banerjee and Duflo (2011) review, among others, the case of Zambia in which a big NGO distributed subsidized chlorine tablets widely, and as a result the campaign informed the population (98 percent identified it as a good way to clean drinking water). However, only 10 percent of families use the tablets. In addition, Banerjee et al. (2010) show that immunization campaigns in rural India are more effective when the poor are given small incentives apart from the vaccines (in this case, lentils and metal plates for completed immunization).

[59] Summerbell et al. 2007. Two recent Cochrane reviews on childhood obesity (Campbell et al. 2001; Summerbell et al. 2005) find only modest evidence that diet education impacts the BMIs and consumption habits of schoolchildren, especially in the short term.

hygiene knowledge (between current levels and full awareness) has been closed. This improvement in knowledge led, in turn, to statistically significant behavior changes in key areas, such as an 8.4 percent increase in the availability of water and soap in the household, hand cleanliness, and observed and caregiver self-reported handwashing behavior before eating, feeding a child, and preparing food. In addition, observed handwashing with soap only increased among the treated households by 61% before eating and by 69% before preparing food, as compared to the control groups. However, these behavior changes did not translate into better child health. Overall, no impact was found on parasite and bacterial prevalence in stools and drinking water (respectively), which is consistent with the fact that there were no effects on diarrhea, micronutrient malnutrition, or anemia.

The results of this study yield important insights for policymakers and practitioners. Although we did not observe treatment effects on health outcomes, the study successfully identified which component of the intervention was more effective in changing handwashing behavior. Handwashing with soap at critical junctures continues to be a preventive measure to improve child health, especially in developing countries with a high incidence of diarrhea. Thus, future efforts should be invested in identifying additional activities, delivery mechanisms, and/or more effective messages in order to ensure significant and sustainable changes in behavior that improve child health.

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Table 1: Effect of the Interventions on Exposure to Handwashing Promotion

	Province level intervention		District level intervention			
	Mass media treatment		Community treatment sample		School component sample	
	Control mean	Effect of treatment	Control mean	Effect of treatment	Control mean	Effect of treatment
Exposure[+]						
High exposure to the treatments (HW message through three channels)	0.147	-0.0039 (0.037)	0.147	0.0551 (0.037)	0.2	-0.0275 (0.041)
Medium exposure to the treatments (HW message through two channels)	0.432	-0.000929 (0.058)	0.432	0.145*** (0.051) [33.5%]	0.499	0.065 (0.050)
Low exposure to the treatments (HW message through one channel)	0.674	-0.065 (0.051)	0.674	0.106** (0.045) [15.7%]	0.717	0.0637* (0.042) [8.9%]

[+]Channels: mass media (radio and/or printed materials), promotional events and personal training/educational sessions
Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

Table 2: Effect of the Interventions on Handwashing Determinants

	Province level intervention		District level intervention			
	Mass media treatment		Community treatment sample		School component sample	
	Control mean	Effect of treatment	Control Mean	Effect of treatment	Control Mean	Effect of treatment
Knowledge						
Events that require handwashing (summary index)	0.225	0.02 (0.019)	0.225	0.009 (0.020)	0.222	0.008 (0.019)
Best method to wash hands	0.879	-0.003 (0.021)	0.879	0.0512* (0.027) [5.8%]	0.882	0.044** (0.021) [4.9%]
Not washing hands with water and soup is main cause of diarrhea	0.94	-0.006 (0.014)	0.94	0.0313** (0.012) [3.3%]	0.94	0.011 (0.014)

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

Table 3: Effect of the Interventions on Behavior Change

	Province level intervention		District level intervention			
	Mass media treatment		Community treatment sample		School component sample	
	Control mean	Effect of treatment	Control mean	Effect of treatment	Control mean	Effect of treatment
Handwashing facilities						
HW Facilities stocked with water and soap	0.653	-0.019	0.653	0.032	0.67	0.062
		(0.057)		(0.048)		(0.043)
Water and soap anywhere in the house	0.787	-0.025	0.787	0.0267	0.768	0.065**
		(0.040)		(0.037)		(0.032)
						[8.4%]
HW hand cleanliness						
Hands Cleanliness Index	7.527	-0.178	7.527	0.278*	7.403	0.210
		(0.166)		(0.161)		(0.151)
				[3.6%]		
Self-Reported handwashing behavior						
HW with soap and water previous to eat	0.415	-0.156***	0.415	0.0252	0.402	0.095**
		(0.040)		(0.046)		(0.044)
		[-37.5%]				[23.6%]
HW with soap and water before food preparation	0.653	-0.007	0.653	0.027	0.694	-0.042
		(0.037)		(0.036)		(0.039)
HW with soap and water after fecal contact	0.654	-0.084**	0.654	0.0254	0.656	0.019
		(0.040)		(0.042)		(0.043)
		[-12.8%]				
HW with soap and water before feeding child	0.206	0.037	0.206	0.004	0.194	0.054*
		(0.031)		(0.034)		(0.030)
						[27.8%]
Structured observations						
Observed HW with soap and water previous to eat	-	-	-	-	0.189	0.115**
						(0.049)
						[60.8%]
Observed HW with soap and water before food preparation	-	-	-	-	0.099	0.068*
						(0.038)
						[68.6%]
Observed HW with soap and water after fecal contact	-	-	-	-	0.342	-0.022
						(0.056)
Observed HW with soap and water before feeding baby	-	-	-	-	0.076	0.04
						(0.060)

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

Table 4: Effect of the Interventions on Environmental Contamination

	Province level intervention		District level intervention			
	Mass media treatment		Community treatment sample		School component sample	
	Control mean	Effect of treatment	Control mean	Effect of treatment	Control mean	Effect of treatment
Water analysis						
Prevalence of E.Coli (Percentage)	-	-	-	-	0.607	-0.041
						(0.072)
Prevalence of total coliforms (Percentage)	-	-	-	-	0.793	-0.044
						(0.062)

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

Table 5: Effect of the Interventions on Child Health

	Province level intervention		District level intervention			
	Mass media treatment		Community treatment sample		School component sample	
	Control mean	Effect of treatment	Control mean	Effect of treatment	Control mean	Effect of treatment
Child health						
Diarrhea prevalence 48 hours	0.04	0.01 (0.013)	0.04	-0.002 (0.011)	0.033	0.0012 (0.009)
Diarrhea prevalence 7 days	0.06	0.011 (0.018)	0.06	0.001 (0.015)	0.069	-0.005 (0.014)
ALRI prevalence 48 hours	0.041	-0.039*** (0.014) [-96.5%]	0.041	-0.011 (0.018)	0.049	-0.0183 (0.020)
ALRI prevalence 7 days	0.051	-0.047*** (0.018) [-89%]	0.051	-0.016 (0.022)	0.056	-0.021 (0.023)
Weight-for-age z-score	-0.69	0.106 (0.082)	-0.69	0.000 (0.085)	-0.82	0.107 (0.087)
Length/Height-for-age z-score	-1.453	0.037 (0.080)	-1.453	-0.056 (0.079)	-1.619	0.083 (0.088)
Weight-for-length/height z-score	0.203	0.14* (0.076)	0.203	0.076 (0.078)	0.165	0.106 (0.083)
Anemia (Hb < 110 g/L)	0.283	-0.046 (0.033)	0.283	-0.026 (0.033)	0.278	-0.022 (0.029)
Parasites in child stools						
Prevalence of parasites	-	-	-	-	0.227	-0.0508 (0.046)
Parasite count	-	-	-	-	0.303	-0.0851 (0.062)

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

The z-scores for the anthropometric measures were calculated discarding the lower and upper 1 percent of the distribution.

Appendix 1: Balance Checks

Individual Variables

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Average number of children under 5 per HH	707	1.459	717	1.398	-0.061	707	1.46	763	1.409	0.051	684	1.493	705	1.435	0.058
Average HH size	707	5	717	5.359	**-0.359***	707	5	763	5.05	-0.05	684	6.26	705	6.04	0.22
Gender (Male): HH head	707	0.908	717	0.898	-0.1	707	0.908	763	0.927	-0.019	684	0.905	705	0.929	-0.024
Age: HH head	706	35.39	713	37.96	**-2.97*****	706	35.392	762	35.757	-0.365	683	38.269	702	38.47	-0.201
Percentage of HH heads that ever attended school	706	0.954	710	0.952	-0.002	706	0.955	763	0.969	-0.014	682	0.959	704	0.97	-0.011
Highest educational level achieved: HH head															
Primary	672	0.382	674	0.445	-0.063	672	0.382	735	0.41	-0.028	649	0.473	677	0.411	0.062
Secondary	672	0.522	674	0.439	**0.083****	672	0.522	735	0.49	0.032	649	0.414	677	0.484	**-0.07***
Trade school	672	0	674	0	-	672	0.052	735	0.061	-0.009	649	0.049	677	0.04	0.009
University	672	0.052	674	0.051	0.001	672	0.043	735	0.039	0.004	649	0.062	677	0.065	-0.003
Gender (Male): other HH members	2831	0.37	3126	0.383	-0.013	2831	0.371	3092	0.379	-0.008	3600	0.406	3555	0.416	-0.01
Age: other HH members	2827	14.18	3123	15	**-0.82***	2827	14.184	3088	14.776	-0.592	3594	13.609	3549	13.689	-0.08
Percentage of other HH members that ever attended school	1783	0.933	2106	0.935	0.002	1783	0.934	1993	0.963	**-0.029****	2557	0.958	2515	0.957	0.001
Highest educational level achieved: other HH members															
Kindergarten	1652	0.078	1941	0.062	**-0.016***	1652	0.078	1911	0.061	**0.017***	2434	0.096	2391	0.081	0.015
Primary	1652	0.518	1941	0.536	-0.018	1652	0.518	1911	0.507	0.011	2434	0.605	2391	0.622	-0.017
Secondary	1652	0.35	1941	0.347	0.003	1652	0.35	1911	0.38	-0.03	2434	0.272	2391	0.269	0.003
Trade school	1652	0.039	1941	0.029	0.01	1652	0.039	1911	0.038	0.001	2434	0.014	2391	0.018	-0.004
University	1652	0.013	1941	0.024	**0.011****	1652	0.014	1911	0.015	-0.001	2434	0.014	2391	0.01	0.004
Percentage of teenagers that spent time on:															0
School	710	0.961	819	0.927	0.034	710	0.962	695	0.965	-0.003	1393	0.933	1375	0.974	-0.041
Studying	710	0.973	819	0.958	0.015	710	0.973	695	0.967	0.006	1393	0.953	1375	0.978	-0.025
Children care	710	0.728	819	0.71	0.018	711	0.729	695	0.683	0.046	1395	0.72	1375	0.723	-0.003
Homework	711	0.713	819	0.752	-0.039	711	0.713	695	0.722	-0.009	1395	0.691	1375	0.699	-0.008
Paid work	711	0.016	819	0.019	-0.003	711	0.017	695	0.01	0.007	1395	0.014	1375	0.007	0.007
Unpaid work	711	0.091	819	0.188	**-0.097****	711	0.091	695	0.056	0.035	1395	0.08	1375	0.094	-0.014

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Treatment mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Percentage of employed HH heads	707	0.945	714	0.948	-0.003	707	0.945	762	0.963	-0.018	682	0.965	705	0.956	0.009
Last week activity: HH head															
Looking for work	39	0.231	37	0.135	0.096	39	0.231	28	0.286	-0.055	24	0.167	31	0.226	-0.059
Taking care of home	39	0.462	37	0.324	0.138	39	0.462	28	0.357	0.105	24	0.542	31	0.484	0.058
Not working and not looking for job	39	0.128	37	0.216	-0.088	39	0.128	28	0.25	-0.122	24	0.208	31	0.161	0.047
Other	39	0.179	37	0.324	-0.145	39	0.179	28	0.107	0.072	24	0.083	31	0.129	-0.046
Percentage of employed other HH members	1055	0.344	1273	0.346	-0.002	1055	0.344	1289	0.38	-0.036	1151	0.381	1119	0.35	0.031
Last week activity: other HH members															
Looking for work	692	0.01	832	0.006	0.004	692	0.01	799	0.005	0.005	713	0.011	727	0.003	**0.008***
Studying	692	0.136	832	0.137	-0.001	692	0.136	799	0.14	-0.004	713	0.181	727	0.169	0.012
Taking care of home	692	0.803	832	0.802	0.001	692	0.803	799	0.801	0.002	713	0.75	727	0.779	-0.029
Not working and not looking for job	692	0.04	832	0.038	0.002	692	0.04	799	0.038	0.002	713	0.046	727	0.03	0.016
Other	692	0.01	832	0.017	-0.007	692	0.01	799	0.016	-0.006	713	0.011	727	0.019	-0.008
Primary work: position															
Self-employed	1290	0.557	1421	0.55	0.007	1290	0.557	1462	0.538	0.019	1325	0.546	1294	0.59	-0.044
Employee	1290	0.302	1421	0.265	0.037	1290	0.302	1462	0.325	-0.023	1325	0.303	1294	0.268	0.035
Employer or boss	1290	0.003	1421	0.001	0.002	1290	0.003	1462	0.005	-0.002	1325	0.004	1294	0.003	0.001
Worker without remuneration	1290	0.123	1421	0.165	-0.042	1290	0.123	1462	0.126	-0.003	1325	0.137	1294	0.134	0.003
Day laborer	1290	0.015	1421	0.018	-0.003	1290	0.015	1462	0.005	0.01	1325	0.008	1294	0.005	0.003
Other	1290	0.001	1421	0.001	0	1290	0.001	1462	0	0.001	1325	0.002	1294	0	0.002
Monthly salary	1082	369.64	1148	334.22	34.42	1082	369.64	1245	391.42	-21.78	1101	351.01	1087	336.88	14.13
Hours per week	1287	42.933	1404	42.551	0.382	1287	42.933	1448	41.823	1.11	1322	40.735	1287	42.045	-1.31
Months worked in last 12 months	1279	9.177	1405	9.731	-0.554	1279	9.177	1446	9.577	-0.4	1307	9.431	1271	9.862	-0.431

Household Assets

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Average HHs non labor income	312	110.37	240	106.01	4.36	312	110.37	205	106.13	4.24	315	111.45	191	129.89	-18.44
HHs Assets															
Radio, CD, cassette	706	0.813	717	0.815	-0.002	706	0.813	762	0.745	**0.068***	682	0.812	705	0.75	**0.062***
TV	707	0.532	717	0.513	0.019	707	0.532	762	0.552	-0.02	682	0.595	705	0.609	-0.014
VCR	707	0.248	717	0.197	0.051	707	0.248	762	0.241	0.007	682	0.224	705	0.254	-0.03
Computer	707	0.02	717	0.015	0.005	707	0.02	762	0.012	0.008	682	0.025	705	0.016	0.009
Bicycle	707	0.184	716	0.196	-0.012	707	0.184	762	0.213	-0.029	682	0.217	705	0.24	-0.023
Motorbike	707	0.025	717	0.032	-0.007	707	0.025	762	0.039	-0.014	682	0.032	705	0.035	-0.003
Car or Tractor	707	0.014	717	0.018	-0.004	707	0.014	762	0.021	-0.007	682	0.015	705	0.007	0.008
Refrigerator	707	0.107	717	0.075	0.032	707	0.107	762	0.079	0.028	682	0.087	705	0.118	-0.031
Gas Stove	707	0.383	717	0.329	0.054	707	0.383	762	0.419	-0.036	682	0.346	705	0.445	-0.099
Other type of stove	706	0.153	717	0.079	**0.074****	706	0.153	762	0.083	**0.07****	682	0.15	705	0.092	**0.058***
Blender	707	0.209	717	0.17	0.039	707	0.209	762	0.22	-0.011	682	0.214	705	0.248	-0.034
Toaster	707	0.004	717	0.013	-0.009	707	0.004	762	0.007	-0.003	682	0.007	705	0.01	-0.003
Microwave	707	0.011	717	0.007	0.004	707	0.011	762	0.005	0.006	682	0.01	705	0.013	-0.003
Washing machine	707	0.006	717	0.003	0.003	707	0.006	762	0.007	-0.001	682	0.009	705	0.011	-0.002
Water boiler	707	0.028	717	0.018	0.01	707	0.028	762	0.016	0.012	682	0.018	705	0.026	-0.008
Other houses/properties	707	0.109	717	0.035	**0.074***	707	0.109	762	0.171	-0.062	682	0.104	704	0.182	-0.078
Machinery, equipment for family business	707	0.023	717	0.031	-0.008	707	0.023	761	0.021	0.002	682	0.015	703	0.02	-0.005
Percentage of HHs having other piece of land	707	0.475	716	0.369	0.106	707	0.475	763	0.383	0.092	684	0.477	705	0.43	0.047
Percentage of HHs having farm equipment	707	0.201	716	0.26	-0.059	707	0.201	763	0.215	-0.014	684	0.2	705	0.214	-0.014
Percentage of HHs having animals	707	0.754	717	0.826	-0.072	707	0.754	763	0.742	0.012	684	0.775	705	0.729	0.046
Average number of livestock owned	707	2.337	717	2.787	-4.5	707	2.337	763	1.992	0.345	684	2.401	705	2.009	0.392

Dwelling Characteristics

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Dwelling ownership															
HH member, still paying	707	0.018	716	0.038	-0.02	707	0.018	762	0.026	-0.008	683	0.041	705	0.027	0.014
HH member, fully paid	707	0.454	716	0.536	**-0.082***	707	0.454	762	0.459	-0.005	683	0.515	705	0.482	0.033
Rented	707	0.13	716	0.084	0.046	707	0.13	762	0.118	0.012	683	0.111	705	0.15	-0.039
Family/Friend Loan	707	0.198	716	0.226	-0.028	707	0.198	762	0.277	**-0.079*****	683	0.145	705	0.197	**-0.052***
Other	707	0.199	716	0.116	**0.083****	707	0.199	762	0.119	**0.08***	683	0.187	705	0.143	0.044
Type of dwelling															
Detached house	699	0.93	715	0.959	-0.029	699	0.93	755	0.926	0.004	679	0.981	700	0.933	**0.048*****
Room in a larger dwelling	699	0.027	715	0.027	**0**	699	0.027	755	0.05	-0.023	679	0.009	700	0.034	**-0.025***
Other	699	0.043	715	0.014	**0.029****	699	0.043	755	0.024	0.019	679	0.01	700	0.033	**-0.023***
Dwelling light source															
No lighting	703	0.001	714	0	0.001	703	0.001	761	0.011	**-0.01****	683	0.004	699	0.016	**-0.012***
Electricity	703	0.686	714	0.576	0.11	703	0.686	761	0.748	-0.062	683	0.717	699	0.785	-0.068
Kerosene	703	0.159	714	0.154	0.005	703	0.159	761	0.059	**0.1****	683	0.127	699	0.059	**0.068***
Candles	703	0.137	714	0.227	**-0.090***	703	0.137	761	0.146	-0.009	683	0.138	699	0.112	0.026
Other	703	0.017	714	0.043	-0.026	703	0.017	761	0.037	-0.02	683	0.013	699	0.029	-0.016
Dwelling cooking fuel															
Gas	703	0.296	714	0.237	0.023	703	0.296	761	0.293	0.003	683	0.233	699	0.313	-0.08
Wood	703	0.587	714	0.718	-0.131	703	0.587	761	0.618	-0.031	683	0.672	699	0.568	0.104
Peat/Manure	703	0.09	714	0.001	**0.089****	703	0.09	761	0.045	0.045	683	0.073	699	0.06	0.013
Other	703	0.027	714	0.043	-0.016	703	0.027	761	0.045	-0.018	683	0.022	699	0.059	-0.037
Dwelling heat fuel															
Do not heat dwelling	706	0.969	717	0.897	**0.072*****	706	0.969	763	0.971	-0.002	683	0.968	705	0.989	**-0.021****
Wood Stove	706	0.02	717	0.095	**-0.07*****	706	0.02	763	0.025	-0.005	683	0.023	705	0.006	**0.017****
Other	706	0.011	717	0.008	0.003	706	0.011	763	0.004	0.007	683	0.009	705	0.006	0.003

	Province level intervention Mass media treatment					District level intervention									
						Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Material of dwelling's walls															
Esteras	699	0.029	715	0.042	-0.013	699	0.029	755	0.032	-0.003	679	0.034	700	0.024	0.01
Brick	699	0.094	715	0.062	0.032	699	0.094	755	0.127	-0.033	679	0.09	700	0.123	-0.033
Concrete	699	0.054	715	0.014	**0.040****	699	0.054	755	0.057	-0.003	679	0.019	700	0.07	**-0.051****
Unbaked brick, adobe	699	0.584	715	0.664	-0.08	699	0.584	755	0.576	0.008	679	0.58	700	0.543	0.037
Wood, logs	699	0.103	715	0.088	0.015	699	0.103	755	0.044	0.059	679	0.138	700	0.051	0.087
Other	699	0.136	715	0.13	0.006	699	0.136	755	0.164	-0.028	679	0.138	700	0.189	-0.051
Material of dwelling's roof															
Esteras	699	0.04	715	0.056	-0.016	699	0.04	755	0.045	-0.005	679	0.05	700	0.054	-0.004
Brick	699	0.023	715	0.038	-0.015	699	0.023	755	0.019	0.004	679	0.029	700	0.024	0.005
Concrete	699	0.052	715	0.017	**0.037***	699	0.052	755	0.038	0.014	679	0.024	700	0.053	**-0.029***
Wood, logs	699	0.019	715	0.007	0.012	699	0.019	755	0.009	0.01	679	0.012	700	0.02	-0.008
Tin, zinc sheeting	699	0.534	715	0.47	0.102	699	0.534	755	0.668	**-0.134***	679	0.571	700	0.636	-0.065
Bamboo	699	0.006	715	0.007	-0.001	699	0.006	755	0.028	-0.022	679	0.01	700	0.023	-0.013
Other	699	0.328	715	0.406	-0.078	699	0.328	755	0.193	**0.135****	679	0.303	700	0.19	**0.113***
Material of dwelling's floor															
Painted wood	699	0.009	713	0.004	0.005	699	0.009	753	0.009	0	679	0.013	700	0.017	-0.004
Concrete	699	0.156	713	0.111	0.045	699	0.156	753	0.159	-0.003	679	0.138	700	0.217	**0.055**
Clay, earthen floor	699	0.701	713	0.749	-0.048	699	0.701	753	0.699	0.002	679	0.698	700	0.636	0.062
Non polished concrete	699	0.076	713	0.093	-0.017	699	0.076	753	0.098	-0.022	679	0.082	700	0.091	-0.009
Other	699	0.059	713	0.043	0.016	699	0.059	753	0.035	0.024	679	0.068	700	0.039	0.029
HH has food not covered	685	0.225	651	0.257	-0.032	685	0.225	704	0.207	0.018	663	0.27	658	0.24	0.03
HH is clean	682	0.543	687	0.518	0.025	682	0.543	715	0.593	-0.05	663	0.508	669	0.538	-0.03
HH with garbage in kitchen or house	686	0.541	677	0.589	-0.048	686	0.541	717	0.488	0.053	668	0.581	666	0.568	0.013

Toilet Facilities and Water Sources

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Main toilet facility															
No facilities, bush, field	717	0.24	707	0.221	0.019	707	0.221	763	0.239	-0.018	683	0.218	704	0.203	0.015
Hanging toilet, latrine	717	0.01	707	0.017	-0.007	707	0.017	763	0.001	0.016	683	0.018	704	0.003	0.015
Flush, to piped sewer system	717	0.132	707	0.226	**-0.094***	707	0.226	763	0.229	-0.003	683	0.217	704	0.339	**-0.122***
Flush, to other place	717	0.047	707	0.095	**-0.048****	707	0.095	763	0.101	-0.006	683	0.088	704	0.101	-0.013
Ventilated improved pit latrine	717	0.073	707	0.042	0.031	707	0.042	763	0.069	-0.027	683	0.028	704	0.061	-0.033
Pit latrine with slab	717	0.033	707	0.034	-0.001	707	0.034	763	0.06	-0.026	683	0.023	704	0.044	-0.021
Pit latrine without slab, open pit	717	0.411	707	0.325	0.086	707	0.325	763	0.263	0.062	683	0.381	704	0.217	**0.164*****
Other	717	0.053	707	0.04	0.013	707	0.04	763	0.037	0.003	683	0.028	704	0.031	-0.003
% of toilet facilities that are public	544	0.121	548	0.144	-0.023	548	0.144	581	0.129	0.015	532	0.092	553	0.105	-0.013
Location of main toilet facility															
Inside household	717	0.156	707	0.202	-0.046	707	0.202	763	0.224	-0.022	684	0.211	705	0.278	-0.067
In household yard	717	0.392	707	0.382	0.01	707	0.382	763	0.391	-0.009	684	0.405	705	0.403	0.002
Less than 10 mins walk	717	0.34	707	0.291	0.049	707	0.291	763	0.248	0.043	684	0.269	705	0.213	0.056
More than 10 mins walk	717	0.071	707	0.088	-0.017	707	0.088	763	0.11	-0.022	684	0.076	705	0.077	-0.001
No designated area	717	0.038	707	0.035	0.003	707	0.035	763	0.025	0.01	684	0.037	705	0.026	0.011
Other	717	0.003	707	0.001	0.002	707	0.001	763	0.003	-0.002	684	0.003	705	0.004	-0.001
Percentage of shared toilet facility	717	0.254	707	0.263	-0.009	707	0.263	763	0.304	-0.041	684	0.23	705	0.271	-0.041
Percentage of safe toilet facilities during the night	715	0.738	707	0.745	-0.007	707	0.745	763	0.773	-0.028	683	0.761	704	0.781	-0.02
Disposal of child defecation															
Bushes, ground	717	0.279	707	0.337	-0.058	707	0.337	763	0.266	0.071	684	0.303	705	0.173	**0.13*****
Pit, hole in the ground	717	0.1	707	0.092	0.008	707	0.092	763	0.087	0.005	684	0.076	705	0.096	-0.02
Open sewer, drain	717	0.025	707	0.048	-0.023	707	0.048	763	0.045	0.003	684	0.047	705	0.065	-0.018
Toilet, latrine	717	0.209	707	0.163	0.046	707	0.163	763	0.215	-0.052	684	0.209	705	0.237	-0.028
Garbage	717	0.301	707	0.301	0	707	0.301	763	0.307	-0.006	684	0.308	705	0.34	-0.032
River	717	0.121	707	0.12	0.001	707	0.12	763	0.092	0.028	684	0.11	705	0.098	0.012
Basin, sink	717	0.114	707	0.098	0.016	707	0.098	763	0.06	0.038	684	0.104	705	0.062	0.042
Other	717	0.064	707	0.071	-0.007	707	0.071	763	0.041	**0.03***	684	0.064	705	0.045	0.019

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Same sources along the year	707	0.97	717	0.974	-0.004	707	0.97	763	0.988	-0.018	683	0.99	705	0.989	0.001
Source of drinking water															
Tanker truck	707	0	717	0.026	**-0.026***	707	0	763	0.004	-0.004	683	0.015	705	0.007	0.008
Surface water	707	0.055	717	0.081	-0.026	707	0.055	763	0.031	0.024	683	0.064	705	0.044	0.02
Piped water, into dwelling	707	0.223	717	0.233	0.142	707	0.223	763	0.249	-0.026	683	0.228	705	0.25	-0.022
Piped water, into yard, plot	707	0.16	717	0.201	-0.041	707	0.16	763	0.232	-0.072	683	0.17	705	0.247	-0.077
Piped water, public tap, standpipe	707	0.051	717	0.095	-0.044	707	0.051	763	0.043	0.008	683	0.053	705	0.045	0.008
Tube well, wore whole	707	0.024	717	0.013	0.011	707	0.024	763	0.01	0.014	683	0.004	705	0.013	-0.009
Dug well, protected	707	0.017	717	0.026	-0.009	707	0.017	763	0.008	0.009	683	0.006	705	0.01	-0.004
Dug well, unprotected	707	0.04	717	0.004	0.036	707	0.04	763	0.007	0.033	683	0.026	705	0.009	0.017
Spring water, protected	707	0.262	717	0.121	**0.152***	707	0.262	763	0.257	0.005	683	0.261	705	0.23	0.031
Spring water, unprotected	707	0.041	717	0.077	-0.036	707	0.041	763	0.031	0.01	683	0.038	705	0.023	0.015
Other	707	0.127	717	0.123	0.004	707	0.127	763	0.127	0	683	0.135	705	0.123	0.012
Source location															
In own dwelling	436	0.128	406	0.074	0.054	436	0.128	396	0.278	-0.15	411	0.148	355	0.282	-0.134
In own yard, plot	436	0.431	406	0.355	0.076	436	0.431	396	0.313	0.118	411	0.372	355	0.287	0.085
Elsewhere	436	0.44	406	0.571	-0.131	436	0.44	396	0.409	0.031	411	0.479	355	0.431	0.048
Covered source															
Covered	433	0.607	404	0.597	0.01	433	0.607	393	0.687	-0.08	407	0.582	355	0.645	-0.063
Open	433	0.372	404	0.389	-0.017	433	0.372	393	0.303	0.069	407	0.388	355	0.352	0.036
Both covered and open	433	0.021	404	0.015	0.006	433	0.021	393	0.01	0.011	407	0.029	355	0.003	0.026
Who mainly collects water from this source															
Adult woman	436	0.846	405	0.847	-0.001	436	0.846	396	0.886	-0.04	411	0.82	355	0.865	-0.045
Adult man	436	0.115	405	0.114	0.001	436	0.115	396	0.086	0.029	411	0.117	355	0.101	0.016
Girl (< 15 years)	436	0.023	405	0.017	0.006	436	0.023	396	0.015	0.008	411	0.027	355	0.014	0.013
Boy (< 15 years)	436	0.014	405	0.02	-0.006	436	0.014	396	0.013	0.001	411	0.022	355	0.02	0.002
Other	436	0.002	405	0.002	0	436	0.002	396	0	0.002	411	0.015	355	0	**-0.015***
Satisfied with the quantity	704	0.724	715	0.734	-0.01	704	0.724	763	0.738	-0.014	681	0.686	702	0.708	-0.022
Does the household pay for the water	706	0.564	716	0.603	-0.039	706	0.564	761	0.662	-0.098	683	0.698	705	0.674	0.024
Fixed, limited quantity obtained for the payment	389	0.524	428	0.339	**0.185****	389	0.524	495	0.442	0.082	466	0.47	465	0.447	0.023
How water was prepared (last 7 days)															
Boil	649	0.948	603	0.954	-0.006	649	0.948	689	0.972	-0.024	618	0.963	635	0.98	-0.017
Chlorine	649	0.034	603	0.06	-0.026	649	0.034	689	0.026	0.008	618	0.026	635	0.02	0.006
Let it stand and settle	649	0.032	603	0.06	-0.028	649	0.032	689	0.022	0.01	618	0.026	635	0.022	0.004
Other	649	0.015	603	0.015	0	649	0.015	689	0	0.015	618	0.01	635	0.002	0.008
Improved water source	707	0.737	717	0.69	0.047	707	0.737	763	0.801	-0.064	683	0.722	705	0.804	-0.082
Improved sanitation	707	0.386	717	0.278	**0.108***	707	0.386	763	0.461	-0.075	683	0.335	704	0.544	**-0.209*****
Soap and water at HW station	707	0.588	717	0.562	0.026	707	0.588	763	0.598	-0.01	684	0.639	705	0.603	0.036

Handwashing Facilities

	Province level intervention Mass media treatment					District level intervention									
						Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Wash hands after going to toilet	698	0.986	707	0.993	-0.007	698	0.986	738	0.985	0.001	675	0.994	674	0.987	0.007
Place where usually wash hands after going to toilet										0					0
Inside toilet facility	683	0.104	685	0.058	**0.046***	683	0.104	718	0.113	-0.009	667	0.1	659	0.118	-0.018
Inside kitchen, cooking place	683	0.105	685	0.067	0.038	683	0.105	718	0.131	-0.026	667	0.112	659	0.082	0.03
In yard less than 3 feet from toilet	683	0.193	685	0.194	-0.001	683	0.193	718	0.132	**0.061****	667	0.219	659	0.185	0.034
Between 10 feet and 3 feet from toilet	683	0.142	685	0.155	-0.013	683	0.142	718	0.117	0.025	667	0.148	659	0.141	0.007
More than 10 feet from toilet	683	0.335	685	0.352	-0.017	683	0.335	718	0.373	-0.038	667	0.315	659	0.34	-0.025
No specific place	683	0.12	685	0.174	-0.054	683	0.12	718	0.134	-0.014	667	0.105	659	0.134	-0.029
Handwashing device, toilet										0					0
Tap, faucet	600	0.643	563	0.584	0.059	600	0.643	620	0.655	-0.012	597	0.631	570	0.695	-0.064
Basin, bucket	600	0.335	563	0.352	-0.017	600	0.335	620	0.319	0.016	597	0.337	570	0.295	0.042
Other	600	0.022	563	0.064	**-0.042****	600	0.022	620	0.026	-0.004	597	0.032	570	0.011	**0.021****
Water available at handwashing station	599	0.871	561	0.85	0.021	599	0.871	619	0.889	-0.018	594	0.877	570	0.854	0.023
Soaps available										0					0
Multipurpose bar soap	601	0.095	567	0.254	**-0.159*****	601	0.095	622	0.127	-0.032	597	0.134	571	0.128	0.006
Beauty, toilet bar soap	601	0.245	567	0.224	0.021	601	0.245	622	0.241	0.004	597	0.214	571	0.254	-0.04
Powder soap, detergent	601	0.486	567	0.347	**0.139****	601	0.486	622	0.471	0.015	597	0.524	571	0.478	0.046
No soap observed	601	0.306	567	0.275	0.031	601	0.306	622	0.273	0.033	597	0.295	571	0.282	0.013
Ash, mud at handwashing station										0					0
Ash	595	0.012	553	0.016	-0.004	595	0.012	614	0.01	0.002	590	0.005	566	0.004	0.001
Mud	595	0.245	553	0.195	0.05	595	0.245	614	0.238	0.007	590	0.237	566	0.221	0.016
Ash and Mud	595	0.034	553	0.045	-0.011	595	0.034	614	0.024	0.01	590	0.049	566	0.037	0.012
Neither observed	595	0.709	553	0.743	-0.034	595	0.709	614	0.728	-0.019	590	0.708	566	0.739	-0.031

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Wash hands before-after cooking, feeding a child	697	0.996	706	0.993	0.003	697	0.996	738	0.996	0	675	0.996	674	0.987	0.009
Place where usually wash hands															
Inside toilet facility	647	0.028	631	0.014	0.014	647	0.028	700	0.011	0.017	635	0.02	636	0.017	0.003
Inside kitchen, cooking place	647	0.396	631	0.361	0.035	647	0.396	700	0.434	-0.038	635	0.413	636	0.414	-0.001
In yard less than 3 feet from kitchen	647	0.207	631	0.195	0.012	647	0.207	700	0.164	0.043	635	0.17	636	0.165	0.005
Between 10 feet and 3 steps from kitchen	647	0.162	631	0.189	-0.027	647	0.162	700	0.154	0.008	635	0.191	636	0.173	0.018
More than 10 feet from kitchen	647	0.124	631	0.127	-0.003	647	0.124	700	0.139	-0.015	635	0.131	636	0.17	-0.039
No specific place	647	0.083	631	0.114	-0.031	647	0.083	700	0.097	-0.014	635	0.076	636	0.061	0.015
Handwashing device															
Tap, faucet	243	0.263	245	0.208	0.055	243	0.263	283	0.314	-0.051	237	0.283	288	0.299	-0.016
Container from which water is poured	243	0.716	245	0.78	-0.064	243	0.716	283	0.678	0.038	237	0.696	288	0.688	0.008
Other	243	0.021	245	0.012	0.009	243	0.021	283	0.007	0.014	237	0.021	288	0.014	0.007
Water available at handwashing station	244	0.75	246	0.785	-0.035	244	0.75	283	0.837	**-0.087***	237	0.819	288	0.792	0.027
Soaps available															
Multipurpose bar soap	244	0.07	246	0.138	-0.068	244	0.07	283	0.078	-0.008	237	0.097	288	0.049	0.048
Beauty, toilet soap	244	0.107	246	0.081	0.026	244	0.107	283	0.11	-0.003	237	0.114	288	0.101	0.013
Powder or laundry soap, detergent	244	0.561	246	0.472	0.089	244	0.561	283	0.509	0.052	237	0.612	288	0.573	0.039
No soap observed	244	0.352	246	0.341	0.011	244	0.352	283	0.385	-0.033	237	0.287	288	0.365	-0.078
Ash, mud at handwashing station															
Ash	240	0.038	241	0.008	0.03	240	0.038	282	0	**0.038***	232	0.013	284	0.007	0.006
Mud	240	0.15	241	0.124	0.026	240	0.15	282	0.078	**0.072***	232	0.168	284	0.123	0.045
Ash and Mud	240	0.058	241	0.087	-0.029	240	0.058	282	0.025	0.033	232	0.069	284	0.053	0.016
Nor Ash nor Mud	240	0.754	241	0.78	-0.026	240	0.754	282	0.897	**-0.143****	232	0.75	284	0.817	-0.067

Handwashing Behavior

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Percentage of caregivers that washed their hands with soap since yesterday	712	0.997	720	0.999	-0.002	712	0.997	765	0.996	0.001	693	0.999	707	0.994	0.005
Last moment of hand wash since yesterday															
Bathing a child	707	0.255	717	0.195	0.06	707	0.255	759	0.244	0.011	689	0.253	703	0.262	-0.009
Washing child's hands	707	0.123	717	0.11	0.013	707	0.123	759	0.083	**0.04***	689	0.094	703	0.083	0.011
Cleaning dishes	707	0.41	717	0.459	-0.049	707	0.41	759	0.348	0.062	689	0.437	703	0.331	**0.106*****
Doing laundry	707	0.436	717	0.445	-0.009	707	0.436	759	0.44	-0.004	689	0.498	703	0.511	-0.013
Because they look dirty	707	0.102	717	0.066	**0.036***	707	0.102	759	0.045	**0.057****	689	0.115	703	0.053	**0.062*****
Bathing oneself	707	0.204	717	0.153	0.051	707	0.204	759	0.219	-0.015	689	0.224	703	0.259	-0.035
Using toilet	707	0.426	717	0.389	0.037	707	0.426	759	0.397	0.029	689	0.356	703	0.385	-0.029
Cleaning baby bottom	707	0.334	717	0.424	**-0.090****	707	0.334	759	0.368	-0.034	689	0.327	703	0.356	-0.029
Cleaning latrine	707	0.021	717	0.01	0.011	707	0.021	759	0.008	**0.013***	689	0.015	703	0.024	-0.009
Cleaning toilet	707	0.035	717	0.035	0	707	0.035	759	0.022	0.013	689	0.036	703	0.028	0.008
Returning home	707	0.123	717	0.13	-0.007	707	0.123	759	0.119	0.004	689	0.129	703	0.134	-0.005
Preparing food, cooking	707	0.717	717	0.763	-0.046	707	0.717	759	0.675	0.042	689	0.704	703	0.643	0.061
Feeding children	707	0.369	717	0.351	0.018	707	0.369	759	0.278	**0.091*****	689	0.335	703	0.282	0.053
Other	707	0.057	717	0.102	**-0.045*****	707	0.057	759	0.075	-0.018	689	0.038	703	0.051	-0.013
Best way to clean hands															
Wipe on cloth	713	0.011	718	0.011	0.989	713	0.011	765	0.013	-0.002	694	0.013	704	0.009	0.004
Wash with water alone	713	0.132	718	0.11	0.43	713	0.132	765	0.116	0.016	694	0.134	704	0.111	0.023
Wash with soap	713	0.847	718	0.864	0.591	713	0.847	765	0.854	-0.007	694	0.84	704	0.865	-0.025
Wash with ash, mud	713	0	718	0.003	0.157	713	0	765	0		694	0.003	704	0	0.003
Other	713	0.01	718	0.013	-0.003	713	0.01	765	0.017	-0.007	694	0.01	704	0.016	-0.006
Self-Reported Behavior:															
HW with soap and water before feeding chil	710	0.367	719	0.35	0.017	710	0.367	762	0.276	**0.091*****	692	0.333	703	0.281	0.052
HW with soap and water before food prep.	710	0.714	719	0.760	-0.046	710	0.714	762	0.671	0.043	692	0.7	703	0.642	0.058
HW with soap and water after fecal contact	710	0.615	719	0.668	-0.053	710	0.615	762	0.628	-0.013	692	0.562	703	0.613	-0.051
Caregiver's fingernails are:															
Visible dirty	714	0.284	719	0.303	-0.019	714	0.284	767	0.21	**0.074***	694	0.281	703	0.225	0.056
Unclean appearance	714	0.322	719	0.325	-0.003	714	0.322	767	0.286	0.036	694	0.336	703	0.297	0.039
Clean	714	0.394	719	0.371	0.023	714	0.394	767	0.505	**-0.111****	694	0.383	703	0.478	**0.098***
Caregiver's palms are:															
Visible dirty	714	0.225	719	0.22	0.005	714	0.225	767	0.154	**0.071***	694	0.225	703	0.137	**0.036***
Unclean appearance	714	0.252	719	0.243	0.009	714	0.252	767	0.207	0.045	694	0.272	703	0.272	0
Clean	714	0.522	719	0.537	-0.015	714	0.522	767	0.639	**-0.117****	694	0.503	703	0.592	-0.089
Caregiver's finger pads are:															
Visible dirty	714	0.224	719	0.224	0	714	0.224	767	0.147	**0.077***	694	0.22	702	0.14	**0.07****
Unclean appearance	714	0.265	719	0.249	-0.016	714	0.265	767	0.21	**0.055***	694	0.277	702	0.255	0.022
Clean	714	0.511	719	0.527	-0.016	714	0.511	767	0.643	**-0.132****	694	0.503	702	0.605	-0.102

*p < 10%, ** < 5%, *** < 1%

Mass Media

	Province level intervention Mass media treatment					District level intervention Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Recalls of any handwashing campaign	714	0.245	722	0.253	-0.008	714	0.245	769	0.224	0.021	694	0.272	711	0.226	0.046

Family-School Relationship

	Province level intervention Mass media treatment					District level intervention Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Participation in schools activities															
Parents association	296	0.176	389	0.288	**-0.112****	296	0.176	301	0.256	-0.08	688	0.196	702	0.249	-0.053
Speeches, conferences	296	0.267	389	0.342	-0.075	296	0.267	301	0.369	**-0.102***	688	0.298	702	0.325	-0.027
Kermesses	296	0.139	389	0.111	0.028	296	0.139	301	0.096	0.043	688	0.122	702	0.094	0.028
APAFA	296	0.72	389	0.584	**0.136****	296	0.72	301	0.611	**0.109***	688	0.67	702	0.598	0.072
Other	296	0.199	389	0.185	0.014	296	0.199	301	0.169	0.03	688	0.161	702	0.175	-0.014
Does not participate	296	0.034	389	0.09	**-0.056****	296	0.034	301	0.053	-0.019	688	0.078	702	0.078	0
Percentage of caregivers that recall any campaign on health and hygiene promoted by the school	296	0.338	389	0.298	0.04	296	0.338	301	0.336	0.002	688	0.39	702	0.392	-0.002

*p < 10%, ** < 5%, *** < 1%

Child Development

Province level intervention					District level intervention									
Mass media treatment					Community treatment sample					School component sample				
Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
581	0.06	557	0.051	0.009	581	0.06	601	-0.014	0.074	533	-0.043	554	-0.057	0.014
581	-0.011	556	-0.03	0.818	581	-0.011	601	0.001	-0.012	532	0.072	554	-0.027	0.099
581	-0.009	554	0.07	0.028	581	-0.009	599	-0.052	0.043	533	0.079	553	-0.08	**0.159***

*p < 10%, ** < 5%, *** < 1%

Child Care Situation

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Average number of times child was left at the charge of another child	732	0.657	735	0.707	-0.05	732	0.657	786	0.641	0.016	717	1.024	729	1.06	-0.036
Average number of times was child left alone	734	0.327	735	0.405	-0.078	734	0.327	786	0.314	0.013	717	0.211	729	0.258	-0.047
Percentage of children with clean aspect	982	0.667	955	0.625	0.042	982	0.667	1027	0.689	-0.022	980	0.624	955	0.672	-0.048
Percentage of children with dirty hands	979	0.501	953	0.518	-0.017	979	0.501	1020	0.429	0.072	976	0.513	951	0.449	0.064
Percentage of children with dirty finger nails	973	0.597	948	0.584	0.013	973	0.597	1018	0.476	**0.121****	969	0.608	945	0.525	**0.083***
dirty face	981	0.414	955	0.452	-0.038	981	0.414	1029	0.331	**0.083***	979	0.441	955	0.365	0.076
clothes	976	0.411	955	0.439	-0.028	976	0.411	1028	0.371	0.04	980	0.476	954	0.399	0.077
Percentage of children with dirty clothes	980	0.989	955	0.988	0.001	980	0.989	1030	0.993	-0.004	981	0.989	956	0.985	0.004
Pot-belly	979	0.153	944	0.144	0.009	979	0.153	1019	0.106	0.047	977	0.159	951	0.139	0.02
Percentage of children wearing shoes (or shoes available)	986	0.853	956	0.844	0.009	986	0.853	1032	0.834	0.019	982	0.869	962	0.823	**0.046***
Percentage of children that play with household objects	733	0.673	734	0.58	**0.093****	733	0.673	784	0.626	0.047	718	0.636	729	0.647	-0.011
Percentage of children that play with toys	733	0.809	734	0.8	0.009	733	0.809	784	0.8	0.009	718	0.788	729	0.813	-0.025
Average number of children's books or pictures	736	0.292	736	0.255	0.037	736	0.292	788	0.208	0.084	718	0.23	730	0.225	0.005
attended early education programs	732	0.04	734	0.03	0.01	732	0.04	783	0.041	-0.001	718	0.033	726	0.032	0.001
Percentage of adults that read books with child	731	0.274	733	0.225	0.049	731	0.274	784	0.241	0.033	717	0.225	729	0.263	-0.038
Percentage of adults that tell stories to the child	732	0.265	731	0.197	**0.068****	732	0.265	784	0.227	0.038	717	0.247	729	0.254	-0.007
Percentage of adults that take the child outside the home	733	0.943	734	0.913	0.03	733	0.943	784	0.926	0.017	718	0.911	729	0.918	-0.007
Percentage of adults that play with the child	733	0.868	734	0.869	-0.001	733	0.868	784	0.857	0.011	718	0.831	729	0.842	-0.011
Average daily caring time	1028	5.038	988	4.924	0.114	1028	5.038	1062	5.704	-0.666	1015	4.858	1001	5.393	-0.535

*p < 10Percentage, ** < 5Percentage, *** < 1Percentage

Child Health

	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
ALRI in prev. 48 hrs	1031	0.029	1003	0.103	**-0.07*** **	1031	0.029	1074	0.049	-0.02	1017	0.031	1012	0.053	-0.022
ALRI in prev. 1 week	1031	0.04	1003	0.139	**-0.09*** **	1031	0.04	1074	0.065	-0.025	1017	0.043	1012	0.073	-0.03
Diarrhea in prev. 48 hrs	1031	0.098	1003	0.082	0.016	1031	0.098	1074	0.101	-0.003	1017	0.077	1012	0.084	-0.007
Diarrhea in prev. 1 week	1031	0.167	1003	0.153	0.014	1031	0.167	1074	0.162	0.005	1017	0.14	1012	0.139	0.001
Household w/ lost hours due child illness	3534	0.014	3832	0.063	**-0.04*** **	3534	0.014	3852	0.019	-0.005	4236	0.02	4232	0.01	0.01
Anemia (Hb < 110 g/L) - children <2	605	0.711	652	0.701	0.01	605	0.711	632	0.731	0.503	596	0.711	565	0.701	0.01

*p < 10%, ** < 5%, *** < 1%

Anthropometric Measures

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
BMI-for-age z-score	709	0.361	719	0.463	-0.102	709	0.361	769	0.405	-0.044	692	0.455	709	0.471	-0.016
Head circumference-for-age z-score	707	-0.238	714	-0.332	0.094	707	-0.238	769	-0.31	0.072	690	-0.281	714	-0.261	-0.02
Arm circumference-for-age z-score	635	0.3	631	0.397	-0.097	635	0.3	684	0.35	-0.05	609	0.271	634	0.314	-0.043
Length/height-for-age z-score	695	-1.318	709	-1.404	0.086	695	-1.318	746	-1.333	0.015	679	-1.436	698	-1.399	-0.037
Weight-for-length/height z-score	692	0.279	692	0.398	-0.119	695	0.279	757	0.35	-0.071	685	0.389	687	0.363	0.026
Weight-for-age z-score	701	-0.528	710	-0.527	0.001	701	-0.528	758	-0.493	-0.035	684	-0.497	700	-0.498	0.001

Microbiology Analysis

	District level intervention				
	School component sample				
	Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference
Prevalence of E.Coli in water	85	0.329	74	0.514	-0.184*
Log10 E. coli, MPN/100ml, Child	86	0.584	74	0.463	0.121
Log10 E. coli, MPN/100ml, Mother	86	0.702	74	0.829	-0.127
Log10 E. coli, MPN/100ml, Object	82	0.595	72	0.621	-0.026
Stool sample, Ascaris detected	86	0.023	74	0.000	0.023
Stool sample, Blastocystis detected	86	0.105	74	0.108	-0.003
Stool sample, Giardia detected	86	0.105	74	0.041	0.064
Parasite count in stools	86	0.233	74	0.149	0.084
Prevalence of parasites in stools	86	0.186	74	0.122	0.064

*p < 10%, ** < 5%, *** < 1%

Appendix2: Attrition

Household Attrition

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Percentage HHs Included in Group	707	0.7222	717	0.8131	-0.0909	707	0.722	763	0.7614	-0.039	684	0.799	705	0.835	-0.036

Baseline Comparison of Non-Attriters

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Average HH size	546	1.461	583	1.397	0.064	546	1.461	581	1.442	0.02	547	6.177	589	6.014	0.164
Percentage of HH heads that are male	546	0.91	583	0.907	0.003	546	0.91	581	0.9277	-0.02	547	0.909	589	0.930	-0.022
Percentage of other HH members that are male	2198	0.37	2563	0.382	-0.012	2198	0.37	2356	0.369	0.00	5030	0.389	5309	0.393	-0.004
Percentage of HH heads that ever attended school	546	0.961	577	0.949	0.012	546	0.961	581	0.967	-0.01	546	0.962	588	0.973	-0.011
Highest educational level achieved by HH head										0.00					0.000
Primary	524	0.374	546	0.457	-0.083	524	0.374	558	0.416	-0.04	522	0.469	568	0.394	0.075
Secondary	524	0.532	546	0.441	**0.091****	524	0.532	558	0.480	0.05	522	0.423	568	0.495	**-0.071***
Preparatory	524	0	546	0	-	524	0	558	0.000	0.00	522	0.002	568	0.000	0.002
Trade School	524	0.053	546	0.043	0.01	524	0.053	558	0.066	-0.01	522	0.048	568	0.042	0.006
University	524	0.04	546	0.056	-0.016	524	0.04	558	0.038	0.00	522	0.057	568	0.069	-0.011
Percentage of teenagers that spent time on:										0.00					0.000
School	552	0.969	673	0.937	0.032	552	0.969	553	0.966	0.00	1103	0.941	1149	0.977	-0.036
Studying	552	0.98	669	0.965	0.015	552	0.98	553	0.966	0.01	1103	0.961	1149	0.983	-0.022
Children care	553	0.726	669	0.696	0.03	553	0.726	553	0.682	0.04	1105	0.726	1149	0.730	-0.004
Homework	553	0.71	669	0.751	-0.041	553	0.71	553	0.731	-0.02	1105	0.692	1149	0.701	-0.008
Paid work	553	0.019	670	0.02	-0.001	553	0.019	553	0.007	0.01	1105	0.014	1149	0.005	**0.009**
Unpaid work	553	0.074	670	0.167	**-0.009****	553	0.074	553	0.045	0.03	1105	0.074	1149	0.096	-0.022
Percentage of employed HH heads	546	0.9395	581	0.955	-0.015	546	0.9395	581	0.962	-0.02	545	0.965	589	0.954	0.011
Primary salary	841	340.48	931	321.09	19.39	841	340.48	926	389.846	-49.37	867	339.348	902	341.755	-2.407
Primary work: hours per week	998	43.078	1151	42.513	0.565	998	43.078	1054	41.599	1.48	1044	40.173	1068	41.596	-1.422
Primary work: months worked in last 12 months	993	9.309	1151	9.807	-0.498	993	9.309	1052	9.711	-0.40	1028	9.346	1057	9.798	**-0.452**
Source of drinking water (Percentage HHS)															
Tanker truck	546	0	583	0.032	**-0.032***	546	0	581	0.002	0.00	546	0.015	589	0.008	0.006
Surface water	546	0.034	583	0.082	**-0.048***	546	0.034	581	0.033	0.00	546	0.055	589	0.036	0.019
Piped water, into dwelling	546	0.25	583	0.236	0.014	546	0.25	581	0.262	-0.01	546	0.233	589	0.267	-0.034
Piped water, into yard, plot	546	0.166	583	0.209	-0.043	546	0.166	581	0.236	-0.07	546	0.167	589	0.224	**-0.057**
Piped water, public tap, standpipe	546	0.045	583	0.087	-0.042	546	0.045	581	0.048	0.00	546	0.060	589	0.049	0.011
Tube well, worewhole	546	0.027	583	0.008	0.019	546	0.027	581	0.010	0.02	546	0.005	589	0.012	-0.006
Dug well, protected	546	0.016	583	0.025	-0.009	546	0.016	581	0.010	0.01	546	0.002	589	0.008	-0.007
Dug well, unprotected	546	0.04	583	0.003	0.037	546	0.04	581	0.007	0.03	546	0.026	589	0.008	**0.017**
Spring water, protected	546	0.23	583	0.126	0.104	546	0.23	581	0.236	-0.01	546	0.253	589	0.241	0.012
Spring water, unprotected	546	0.043	583	0.07	-0.027	546	0.043	581	0.022	0.02	546	0.040	589	0.022	0.018
Other	546	0.142	583	0.116	0.026	546	0.142	581	0.134	0.01	546	0.145	589	0.124	0.021
Diarrhea prevalence (Percentage of children under 5)															
2 days	797	0.102	815	0.078	0.024	797	0.102	838	0.095	0.01	816	0.077	840	0.080	-0.003
7 days	797	0.174	815	0.154	0.02	797	0.174	838	0.156	0.02	816	0.145	840	0.140	0.004

*** p<0.01 ** p<0.05 * p<0.1

Comparison of Replacement Households

	Province level intervention					District level intervention									
	Mass media treatment					Community treatment sample					School component sample				
	Control mean		Treatment mean			Control mean		Treatment mean			Control mean		Treatment mean		
	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference	N	Avg.	N	Avg.	Difference
Average HH size	153	4.588	132	4.719	-0.131	153	4.588	179	4.587	0.002	122	4.852	115	5.130	-0.278
Percentage of HH heads that are male	152	0.921	131	0.931	-0.01	152	0.921	179	0.860	0.061	122	0.877	114	0.860	0.017
Percentage of other HH members that are male	550	0.383	492	0.369	0.014	550	0.384	642	0.399	-0.015	470	0.402	476	0.391	0.011
Percentage of HH heads that ever attended school	150	0.946	131	0.961	-0.015	153	1.216	179	1.268	-0.052	122	1.320	115	1.209	**0.111****
Highest educational level achieved by HH head										0.000					0.000
Primary	119	0.184	101	0.207	-0.023	150	0.947	179	0.961	-0.014	122	0.975	114	0.921	0.054
Secondary	119	0.1	101	0.099	0.001	141	0.333	171	0.380	-0.047	117	0.282	103	0.398	**-0.116****
Preparatory	119	0.512	101	0.455	0.057	141	0.553	171	0.497	0.056	117	0.547	103	0.534	0.013
Trade school	119	0.193	101	0.237	-0.044	141	0.092	171	0.064	0.028	117	0.120	103	0.039	0.081
University	119	0.008	101	0	0.008	141	0.021	171	0.058	-0.037	117	0.051	103	0.029	0.022
% of employed HH heads	152	0.96	131	0.938	0.022	152	0.961	179	0.939	0.022	122	0.893	114	0.921	-0.028
Source of drinking water (% HHS)										0.000					0.000
Tanker truck	153	0	132	0	-	153	0.000	179	0.000	0.000	122	0.008	115	0.000	0.008
Water vendor	153	0	132	0	-	153	0.000	179	0.000	0.000	122	0.016	115	0.000	0.016
Surface water	153	0.019	132	0.022	-0.003	153	0.020	179	0.039	-0.019	122	0.016	115	0.043	-0.027
Bottled water	153	0.013	132	0	0.013	153	0.013	179	0.000	0.013	122	0.025	115	0.000	0.025
Piped water, into dwelling	153	0.281	132	0.333	-0.052	153	0.281	179	0.296	-0.015	122	0.320	115	0.426	-0.106
Piped water, into yard, plot	153	0.464	132	0.356	0.108	153	0.464	179	0.486	-0.022	122	0.393	115	0.357	0.037
Piped water, public tap, stand	153	0.071	132	0.136	-0.065	153	0.072	179	0.056	0.016	122	0.066	115	0.017	0.048
Dug well, protected	153	0.065	132	0	0.065	153	0.065	179	0.011	0.054	122	0.033	115	0.000	0.033
Dug well, unprotected	153	0	132	0.015	-0.015	153	0.000	179	0.000	0.000	122	0.000	115	0.017	-0.017
Spring water, protected	153	0.032	132	0.068	-0.036	153	0.033	179	0.017	0.016	122	0.008	115	0.043	-0.035
Spring water, unprotected	153	0.019	132	0.037	-0.018	153	0.020	179	0.011	0.008	122	0.008	115	0.009	0.000
Rainwater	153	0	132	0	-	153	0.000	179	0.006	-0.006	122	0.000	115	0.000	0.000
Other	153	0.026	132	0.015	0.011	153	0.026	179	0.050	-0.024	122	0.107	115	0.070	0.037

*** p<0.01 ** p<0.05 * p<0.1 *** p<0.01 ** p<0.05 * p<0.1

Appendix 3: Robustness Checks

Mass Media Treatment

	Control mean	(1)	(2)	(3)
Exposure[+]				
High exposure to the treatments	0.147	0.0266	0.0145	0.0039
(HW message through three channels)		(0.040)	(0.037)	(0.037)
Medium exposure to the treatments	0.432	0.0308	0.0145	-0.00929
(HW message through two channels)		(0.061)	(0.057)	(0.058)
Low exposure to the treatments	0.674	-0.0343	-0.0457	-0.0613
(HW message through one channel)		(0.054)	(0.054)	(0.056)
Controls		NO	YES	YES
District dummies		NO	NO	YES

[+]Channels: mass media (radio and/or printed materials), promotional events and personal training/educational sessions

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Knowledge				
Events that require handwashing (summary index)	0.225	0.0221	0.0215	0.02
		(0.018)	(0.019)	(0.019)
Best method to wash hands is using water and soap (Percentage)	0.879	0.005	0.0115	-0.003
		(0.028)	(0.025)	(0.021)
Main cause of diarrhea is not washing hands with water and soap (Percentage)	0.94	-0.002	-0.001	-0.006
		(0.016)	(0.016)	(0.014)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Handwashing facilities				
HW Facilities stocked with water and soap (=1)	0.653	-0.029	-0.031	-0.019
		(0.057)	(0.058)	(0.057)
Water and soap anywhere in the house (=1)	0.787	-0.028	-0.029	-0.025
		(0.040)	(0.040)	(0.040)
Hand cleanliness				
Hands Cleanliness Index	7.527	-0.327	-0.294*	-0.178
		(0.204)	(0.177)	(0.166)
			[3.9%]	
Self-Reported handwashing behaviour				
HW with soap and water previous to eat	0.415	-0.166***	-0.162***	-0.156***
		(0.040)	(0.038)	(0.040)
		[-40%]	[-39%]	[-37.5%]
HW with soap and water before food prep.	0.653	0.0054	0.009	-0.007
		(0.037)	(0.037)	(0.037)
HW with soap and water after fecal contact	0.654	-0.088**	-0.092**	-0.084**
		(0.037)	(0.037)	(0.040)
		[-13.4%]		[-12.8%]
HW with soap and water before feeding child	0.206	0.036	0.032	0.037
		(0.029)	(0.030)	(0.031)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Child health (children < 5 years old)				
Diarrhea prevalence 48 hours	0.04	0.014	0.013	0.01
		(0.014)	(0.013)	(0.013)
Diarrhea prevalence 7 days	0.06	0.019	0.017	0.011
		(0.019)	(0.018)	(0.018)
ALRI prevalence 48 hours	0.041	-0.035***	-0.035**	-0.039***
		(0.013)	(0.014)	(0.014)
		[-96%]	[-96%]	[-96.5%]
ALRI prevalence 7 days	0.051	-0.042**	-0.041**	-0.047**
		(0.017)	(0.016)	(0.018)
		[-82.3%]	[-80.3%]	[-89%]
Weight-for-age z-score	-0.69	0.0616	0.037	0.106
		(0.098)	(0.092)	(0.094)
Length/Height-for-age z-score	-1.453	-0.0328	-0.034	0.0371
		(0.106)	(0.091)	(0.080)
Weight-for-length/height z-score	0.203	0.119	0.12	0.140*
		(0.079)	(0.078)	(0.077)
Anemia (Hb < 110 g/L)	0.283	-0.0321	-0.0374	-0.046
		(0.036)	(0.032)	(0.033)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

Community Treatment

	Control mean	(1)	(2)	(3)
Exposure[+]				
High exposure to the treatments	0.147	0.0750*	0.0491	0.0551
(HW message through three channels)		(0.042)	(0.037)	(0.037)
Medium exposure to the treatments	0.432	0.176***	0.138**	0.145***
(HW message through two channels)		(0.059)	(0.054)	(0.051)
		[40%]	[32%]	[34%]
Low exposure to the treatments	0.674	0.127**	0.103**	0.106**
(HW message through one channel)		(0.050)	(0.047)	(0.045)
		[19%]	[15%]	[16%]
Controls		NO	YES	YES
District dummies		NO	NO	YES

[+]Channels: mass media (radio and/or printed materials), promotional events and personal training/educational sessions
Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Knowledge				
Events that require handwashing (summary index)	0.225	0.0152	0.007	0.009
		(0.020)	(0.020)	(0.020)
Best method to wash hands is using water and soap (Percentage)	0.879	0.0402	0.0539*	0.0512*
		(0.028)	(0.025)	(0.021)
			[6.1%]	[5.8%]
Main cause of diarrhea is not washing hands with water and soap	0.94	0.0272**	0.0320**	0.0313**
(Percentage)		(0.012)	(0.013)	(0.012)
		[2.8%]	[3.4%]	[3.2%]
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Handwashing facilities				
HW Facilities stocked with water and soap (=1)	0.653	0.0238	0.0406	0.0326
		(0.049)	(0.048)	(0.048)
Water and soap anywhere in the house (=1)	0.787	0.0126	0.0279	0.0267
		(0.039)	(0.039)	(0.038)
Hand cleanliness				
Hands Cleanliness Index	7.527	0.245	0.278*	0.246
		(0.184)	(0.161)	(0.154)
			[3.7%]	
Self-Reported handwashing behaviour				
HW with soap and water previous to eat	0.415	0.011	0.025	0.036
		(0.046)	(0.046)	(0.044)
HW with soap and water before food prep.	0.653	0.002	0.017	0.027
		(0.043)	(0.038)	(0.037)
HW with soap and water after fecal contact	0.654	-0.004	0.015	0.0254
		(0.044)	(0.042)	(0.038)
HW with soap and water before feeding child	0.206	0.000	0.002	0.004
		(0.030)	(0.030)	(0.030)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Child health (children < 5 years old)				
Diarrhea prevalence 48 hours	0.040	-0.006	-0.003	-0.002
		(0.011)	(0.011)	(0.011)
Diarrhea prevalence 7 days	0.060	-0.001	0.001	0.002
		(0.016)	(0.016)	(0.016)
ALRI prevalence 48 hours	0.041	-0.008	-0.014	-0.011
		(0.019)	(0.018)	(0.019)
ALRI prevalence 7 days	0.051	-0.009	-0.019	-0.017
		(0.024)	(0.022)	(0.022)
Weight-for-age z-score	-0.69	0.006	0.041	0.000
		(0.099)	(0.089)	(0.085)
Length/Height-for-age z-score	-1.453	-0.013	-0.019	-0.056
		(0.099)	(0.086)	(0.080)
Weight-for-length/height z-score	0.203	0.074	0.111	0.076
		(0.086)	(0.082)	(0.079)
Anemia (Hb < 110 g/L)	0.283	-0.049	-0.039	-0.026
		(0.037)	(0.035)	(0.033)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

School Component Sample of Community Treatment

	Control mean	(1)	(2)	(3)
Exposure[+]				
High exposure to the treatments	0.2	0.0113	-0.0207	-0.0275
(HW message through three channels)		(0.047)	(0.043)	(0.043)
Medium exposure to the treatments	0.499	0.100*	0.0659	0.065
(HW message through two channels)		(0.058)	(0.051)	(0.050)
Low exposure to the treatments	0.717	0.0851*	0.0591	0.0637
(HW message through one channel)		(0.046)	(0.041)	(0.039)
				[8.9%]
Controls		NO	YES	YES
District dummies		NO	NO	YES

[+]Channels: mass media (radio and/or printed materials), promotional events and personal training/educational sessions
Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Knowledge				
Events that require handwashing (summary index)	0.222	0.0188	0.00894	0.0159
		(0.021)	(0.020)	(0.020)
Best method to wash hands is using water and soap (Percentage)	0.882	0.0513**	0.049**	0.044**
		(0.023)	(0.021)	(0.022)
		[5.7%]	[5.5%]	[4.9%]
Main cause of diarrhea is not washing hands with water and soap	0.94	0.0131	0.0163	0.0118
		(0.016)	(0.016)	(0.015)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Handwshing facilities				
HW facilities stocked with water and soap (=1)	0.67	0.057	0.071	0.062
		(0.045)	(0.044)	(0.043)
Water and soap anywhere in the house (=1)	0.768	0.056	0.065**	0.067**
		(0.034)	(0.033)	(0.033)
			[8.4%]	[8.7%]
Hand cleanliness				
Hands Cleanliness Index	7.403	0.205	0.226	0.21
		(0.172)	(0.158)	(0.151)
Self-Reported handwashing behaviour				
HW with soap and water previous to eat	0.402	0.056	0.069	0.095**
		(0.050)	(0.049)	(0.044)
HW with soap and water before food prep.	0.694	-0.052	-0.047	-0.042
		(0.041)	(0.040)	(0.039)
HW with soap and water after fecal contact	0.656	-0.0121	-0.0000743	0.0199
		(0.050)	(0.049)	(0.043)
HW with soap and water before feeding child	0.194	0.0387	0.0526*	0.0546*
		(0.034)	(0.031)	(0.030)
			[27%]	[28%]
Structured observations				
Observed HW with soap previous to feeding baby	0.076	-0.001	0.001	0.04
		(0.048)	(0.054)	(0.060)
Observed HW with soap after fecal contact	0.342	-0.028	-0.021	-0.022
		(0.059)	(0.054)	(0.056)
Observed HW with soap previous to preparing food	0.099	0.067	0.077**	0.068*
		(0.041)	(0.038)	(0.038)
		[67.6%]	[77.7%]	[68.6%]
Observed HW with soap previous to eat	0.189	0.096*	0.101**	0.115**
		(0.050)	(0.047)	(0.049)
		[50.7%]	[53.4%]	[60.8%]
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

	Control mean	(1)	(2)	(3)
Child health (children < 5 years old)				
Diarrhea prevalence 48 hours	0.033	0.000	-0.002	0.001
		(0.010)	(0.010)	(0.010)
Diarrhea prevalence 7 days	0.061	-0.005	-0.005	-0.005
		(0.015)	(0.014)	(0.014)
ALRI prevalence 48 hours	0.049	-0.011	-0.017	-0.018
		(0.022)	(0.020)	(0.020)
ALRI prevalence 7 days	0.056	-0.012	-0.020	-0.021
		(0.025)	(0.023)	(0.023)
Weight-for-age z-score	-0.82	0.0994	0.148	0.107
		(0.094)	(0.091)	(0.087)
Length/Height-for-age z-score	-1.619	0.12	0.119	0.0833
		(0.094)	(0.091)	(0.088)
Weight-for-length/height z-score	0.165	0.0743	0.135	0.106
		(0.090)	(0.083)	(0.083)
Anemia (Hb < 110 g/L)	0.278	-0.040	-0.027	-0.022
		(0.033)	(0.029)	(0.029)
Parasites in child stools				
Prevalence of parasites	0.227	-0.016	-0.051	-0.045
		(0.055)	(0.046)	(0.041)
Parasite count	0.303	-0.033	-0.085	-0.068
		(0.078)	(0.062)	(0.053)
Controls		NO	YES	YES
District dummies		NO	NO	YES

Clustered standard errors in parentheses; *** p<0.01 ** p<0.05 * p<0.1

Appendix 4: Variable Description

Variable	Unit of Observation	Description	Total Number of Observations (endline)
Individual Characteristics			
Age: Head of HH	Head of HH	Average age in years	3,518
Age: Other HH members	Other HH members	Average age in years	14,981
Gender (male): Head of HH	Head of HH	Male gender indicator	3,518
Gender (male): Other HH members	Other HH members	Male gender indicator	14,981
Average number of children under 5	HH	Children under 5 per HH	3,563
Average household size	HH	Members per HH	3,547
Percent of Heads of HH that ever attended school	Head of HH	-	3,495
Highest educational level achieved: Head of HH	Head of HH	-	3,308
Percent of other HH members that ever attended school	Other HH members	-	10,345
Highest educational level achieved: other HH members	Other HH members	-	9,840
Percent of teenagers that spent time on school and other activities	Attending school individuals	Positive hours indicator	19903
Percent of employed heads of HH	Head of HH	Employment status indicator	3,514
Last week activity: head of HH	Unemployed head of HH	-	225
Percent of employed other HH members	Other HH members	Employment status indicator, +15 years	5,224
Last week activity: other HH members	Unemployed other HH members	-	3,328
Primary work: position	Employed individuals	-	6,797
Primary work: monthly salary	Employed individuals	-	5,850
Primary work: hours per week	Employed individuals	-	6797
Primary work: months worked in last 12 months	Employed individuals	-	6,797
Households Assets			
HH's assets	Household	Possession of assets indicator	3,547
Percent of HHs having other piece of land	Household	Land possession indicator	3,547
Percent of HHs having farm equipment	Household	Farm equipment possession indicator	3,547
Percent of HHs having animals	Household	Animal possession indicator	3,547
Average number of livestock owned	Household	Average number of total livestock owned	3.547
Dwelling ownership	Household	-	3,547

Dwelling Characteristics			
Type of dwelling	Household	-	3,544
Dwelling light source	Household	-	3,547
Dwelling cooking fuel	Household	-	3,5447
Dwelling heat fuel	Household	-	3,547
Material of dwelling's walls	Household	-	3,544
Material of dwelling's roof	Household	-	3,544
Material of dwelling's floor	Household	-	3,543
Percent of HHs with food not covered	Household	-	3,055
Percent of clean HHs	Household	-	3,527
Percent of HHs with garbage in kitchen or house	Household	-	3,255
Main toilet facility	Household	-	3,547
Toilet Facilities			
Percent of toilet facilities that are public	Household	-	3,033
Location of main toilet facility	Household	-	3,547
Percent of shared toilet facility	Household	-	3,547
Percent of safe toilet facilities during the night	Household	-	3,547
Disposal of child defecation	Household	-	3,547
Improved water source	Household	-	3,492
Improved sanitation	Household	-	3,547
Soap and water at handwashing station	Household	-	3,547
Water Source			
Source of drinking water	Household	Rainy station only, Smaller categories grouped in Other	3,547
Source location	Household	Rainy station only	263
Covered source	Household	Rainy station only	263
Who mainly collects water from this source	Household	Rainy station only	806
Satisfied with the quantity	Household	Rainy station only	3,526
Does the household pay for the water	Household	Rainy station only	3,529
Fixed, limited quantity obtained for the payment	Household	Rainy station only	2,374
How water was prepared (last seven days)	Household	-	3,067
Wash hands after going to toilet	Household	Yes/No: Any HH member	3,526
Handwashing Facilities			
Place where usually wash hands after going to toilet	Household	-	3,435

Handwashing device, toilet	Household	-	3,252
Water available at handwashing station	Household	-	1107
Soap available	Household	Allows multiple answers	3,547
Wash hands before/after cooking, feeding a child	Household	Any HH member	3,529
Place where usually wash hands before/after cooking, feeding a child	Household	-	3,49
Handwashing facilities stocked with water and soap	Household	Percent of HH that have a place to wash hands inside the house or in the yard (in this case, ONLY if it less than 3 meters away from a bathroom); the place must have water available and soap of any kind.	3,547
Water and soap anywhere in the house	Household	Percent of HH that have a place to wash hands (anywhere) with water available and soap of any kind.	3,547
Exposure Measures			
High exposure to the treatments	Caregivers	Percent of caregivers exposed to handwashing promotion through three channels (mass media, promotional events and training/educational sessions)	3,545
Medium exposure to the treatments	Caregivers	Percent of caregivers exposed to handwashing promotion through two channels (mass media and either promotional events or training/educational sessions)	3,545
Low exposure to the treatments	Caregivers	Percent of caregivers exposed to handwashing promotion through one channel only (mass media or promotional events or training/educational sessions)	3,545
Handwashing Knowledge			
Events that require handwashing (summary index)	Caregivers	Proportion of "yes" answers to the following questions: "When do you think it is necessary to wash your hands with soap? A) After cleaning baby bottom; B) After using the toilet, C) Before Eating; D) Before feeding the baby; E) Before preparing food".	3,591
Best method to wash hands is using water and soap (	Caregivers	Percent of caregivers that answer	3,553

percent)		"washing hands with water and soap" to the following question: "What is the best way to clean hands"	
Main cause of diarrhea is not washing hands with water and soup (percent)	Caregivers	Percent of caregivers that mention "Not washing hands with water and soap" to the following question: "What causes diarrhea?"	3,582
Family-School Relationship			
Percent of caregivers that recall any campaign on health and hygiene promoted by the school	Caregiver of child attending primary school	-	2,376
Handwashing Behavior			
Percent of caregivers that washed their hands with soap since yesterday	Caregiver of child under the age of 5	-	3,579
Last moment of hand wash since yesterday	Caregiver of child under the age of 5	Allows multiple answers	3,196
Best way to clean hands	Caregiver of child under the age of 5	Allows multiple answers	3,553
Caregiver's fingernails are:	Caregiver of child under the age of 5	-	3,556
Caregiver's palms are:	Caregiver of child under the age of 5	-	3,556
Caregiver's finger pads are:	Caregiver of child under the age of 5	-	3,556
Recalls of any handwashing campaign	Caregiver of child under the age of 5	-	3,543
Participation in schools activities	Caregiver of child attending primary school	Allows multiple answers	3,543
Hands Cleanliness Index	Caregiver of child attending primary school	Index composed by three elements: • Nails: +1 if visibly dirty, +2 if apparently dirty, +3 if clean. • Palms: +1 if visibly dirty, +2 if apparently dirty, +3 if clean. • Fingerpads: +1 if visibly dirty, +2 if apparently dirty, +3 if clean. The range of the index is from 3 to 9, and it goes up when hands are	3,549

		cleaner.	
Handwashing w/soap and water previous to eat	Caregiver	Self-reported handwashing with soap previous to eat	3,560
Handwashing w/soap and water before food preparation	Caregiver	Self-reported handwashing with soap before preparing food	3,560
Handwashing w/ soap and water after fecal contact	Caregiver	Self-reported handwashing with soap after fecal contact (after using the bathroom/after changing diaper)	3,560
Handwashing w/ soap and water before feeding child	Caregiver	Self-reported handwashing with soap before feeding child	3,560
Structured Observations			
Observed handwashing w/soap and water previous to eat	Caregiver	Observed handwashing with soap prior to eating	1,255
Observed handwashing w/soap and water before food preparation	Caregiver	Observed handwashing with soap before preparing food	1,256
Observed handwashing w/soap and water after fecal contact	Caregiver	Observed handwashing with soap after fecal contact (after using the bathroom/after changing diaper)	901
Observed handwashing w/soap and water before feeding child	Caregiver	Observed handwashing with soap before feeding child	250
Childcare Situation			
Percent of children with clean aspect	Children under the age of 5	-	4,563
Percent of children with dirty hands	Children under the age of 5	-	4,563
Percent of children with dirty finger nails	Children under the age of 5	-	4,563
Percent of children with dirty face	Children under the age of 5	-	4,563
Percent of children wearing clothes	Children under the age of 5	-	4,563
Percent of children with dirty clothes	Children under the age of 5	-	4,563
Percent of children with pot-belly	Children under the age of 5	-	4,563
Percent of children wearing shoes (or shoes available)	Children under the age of 5	-	4,563
Percent of children that play with household objects	Children under the age of 5	-	688
Percent of children that play with toys	Children under the age of 5	-	688
Average number of children's books or pictures	Children under the age of 5	-	688
Percent of children that attended early education programs	Children under the age of 5	-	688
Percent of adults that read books with child	Children under the age of 5	-	688
Percent of adults that tell stories to the child	Children under the age of 5	-	688
Percent of adults that take the child outside the home	Children under the age of 5	-	688
Percent of adults that play with the child	Children under the age of 5	-	688

Average daily caring time	Caregiver of child under the age of 5	-	4,404
Child Development			
ASQ communication skills-for-age z-score	Children under the age of 5	Z-score computed child development index based on caregivers responses to certain child's reactions to specific stimuli and achieved milestones. The questions were based on the Ages and Stages Questionnaire and the skills measured included three domains: communications, gross-motor and social/personal skills. age.	3,628
ASQ gross-motor skills-for-age z-score	Children under the age of 5		3,624
ASQ social-personal skills-for-age z-score	Children under the age of 5		3,627
Average number of times child was left at the charge of another child	Children under the age of 2	-	688
Average number of times was child left alone	Children under the age of 2	-	688
Child Health			
ALRI prevalence (48 hours)	Children under the age of 5	ALRI symptoms: constant cough or difficulty breathing, and raised respiratory rate (according to WHO)	4,563
ALRI prevalence (7 days)	Children under the age of 5		4,563
Diarrhea prevalence (48 hours)	Children under the age of 5	Diarrhea symptoms: 3 or more stools per day and stools were loose or watery, or blood and/or mucus were present in stool.	4,563
Diarrhea prevalence (7 days)	Children under the age of 5		4,563
Anemia (Hb < 110 g/L)	Children under the age of 5	Percent of children under 5 with hemoglobin levels < 100 g/L. Hemoglobin counts were altitude-adjusted	4,083
Anthropometric Measures			
BMI-for-age z-score	Children under the age of 5	Z-scores were adjusted taking into account child's age; values outside reasonable bounds were not considered (following	4,347
Head circumference-for-age z-score	Children under the age of 5		4,375
Length/height-for-age z-score	Children under the age of 5		4,354
Arm circumference-for-age z-score	Children under the age of 5		4,342

Weight-for-length/height z-score	Children under the age of 5	recommendations by WHO) BMI stands for body mass index.	4,343
Weight-for-age z-score	Children under the age of 5		4,369
Prevalence of stunting (percent)	Children under the age of 5	Percent of children under 5 whose length/height-for-age indicator is less than 2 SD from its Z-score mean.	4,354
Prevalence of underweight (percent)	Children under the age of 5	Percent of children under 5 whose weight-for-age indicator is less than 2 SD from its Z-score mean.	4,369
Prevalence of wasting (percent)	Children under the age of 5	Percent of children under 5 whose weight-for-length indicator is less than 2 SD from its Z-score mean.	4,343
Water Contamination			
Prevalence of E.Coli	Children under 5	=1 if *E.Coli*> 0.013 NMPx mL, 0 otherwise Water collected only in T3	575
Prevalence of total coliforms	Children under 5	=1 if *Total Coliforms* > 0.013 NMPx mL, 0 otherwise Water collected only in T3	575
Parasite Prevalence			
Prevalence of any parasites	Children under 5	Percent of children with any parasites (Trichura, Ascaris, Uncinaria or others) detected in stool samples	1,552
Parasite count	Children under 5	Parasite count present in child's stool sample. It sums 1 for each different type of parasite found on the sample (Trichura, Ascaris, Uncinaria, Others)	1,552