Online Appendix

A1 A Model of Learning and Hygiene

A1.1 Setup

In this section, we develop a simple learning model in order to interpret the experiment and motivate the interaction with traditional medical beliefs. People have utility over health, h, and other consumption, c: $u(h, c) = \alpha \ln(h) + \phi \ln(c)$, which is a monotonic transformation of Cobb-Douglas utility. Health is a function of hygiene effort, $e \geq 0$, and an exogenous health input, $s \geq 0$, such as the health endowment or physical environment. The health production function, $h(e, s) = e^{\theta} s^{\gamma}$ for $\theta, \gamma \geq 0$, represents the "true" relationship between these inputs and health. The restriction that $\theta \geq 0$ means that in reality hygiene is weakly beneficial for health. People face the budget constraint $pe + c \leq y$, in which p is the price of hygiene and y is wealth. This approach collapses the cost of hygiene into one dimension and assumes that the cost is linear rather than convex.

People do not directly observe θ but have beliefs about this parameter, $\bar{\theta} \sim N(\bar{\mu}, \bar{\tau})$. $\bar{\theta}$ is a generic belief, and we define the prior belief ($\tilde{\theta}$), the informational signal ($\hat{\theta}$), and the posterior belief (θ') below. The mean, $\bar{\mu}$, represents the perceived effectiveness of hygiene, while the precision (inverse variance), $\bar{\tau}$, represents the certainty of this belief. Negative values of $\bar{\theta}$ capture the perception that hygiene is harmful.

People maximize expected utility to choose e^*. The need for expected utility arises because people face uncertainty about $\bar{\theta}$. We substitute in the health production function and the budget constraint and calculate the expectation to obtain the following objective function.

$$\max_{e} \; E(u) = \alpha \bar{\mu} \ln(e) + \alpha \gamma \ln(s) + \phi \ln(y - pe) \tag{A1}$$

The derivative of this expression with respect to e leads to a first order condition and a closed-form solution, $e^*(y,p)$, which we substitute into the health production function to obtain $h^*(y,p,s)$. For clarity, we define $\bar{\delta} \equiv \phi + \alpha\bar{\mu}$.

$$e^*(y,p) = \frac{\alpha\bar{\mu}y}{p\bar{\delta}} \tag{A2}$$

$$h^*(y,p,s) = \frac{(\alpha\bar{\mu}y)^{\theta}s^{\gamma}}{(p\bar{\delta})^{\theta}} \tag{A3}$$

Although $\bar{\theta}$ may be positive or negative, Equation (A2) shows shows that negative values of $\bar{\mu}$ lead to a corner solution in which $e^* = 0$. We proceed by focusing on the interior solution in which $\bar{\mu}$ and e^* are positive.

A1.2 The Impact of Information

People have normally-distributed prior beliefs about the effectiveness of hygiene, $\tilde{\theta} \sim N(\tilde{\mu}, \tilde{\tau})$. The intervention delivers a normally-distributed informational signal, $\hat{\theta} \sim N(\hat{\mu}, \hat{\tau})$, and people update their beliefs according to Bayes' rule. We adopt Bayesian learning for convenience but acknowledge that other learning models have similar implications. The normality of the prior and the signal imply that the posterior belief, θ', is also normally distributed: $\theta' \sim N(\mu', \tau')$. The posterior mean is the average of the prior and signal means, weighted by the prior and signal precisions.

$$\mu' = \frac{\tilde{\tau}}{\tilde{\tau}+\hat{\tau}}\tilde{\mu} + \frac{\hat{\tau}}{\tilde{\tau}+\hat{\tau}}\hat{\mu} \tag{A4}$$

The average treatment effect (ATE) of hygiene information on θ is the average difference in θ between the treatment and control groups: $E[\theta_{i1} - \theta_{i0}]$. This expression equals $E[\theta' - \tilde{\theta}]$ because treatment respondents update their beliefs while control respondents do not. We sign this and other prediction by assuming that $\hat{\mu} > \tilde{\mu}$, so that the signal leads people to revise θ upward.

$$E[\theta_{i1} - \theta_{i0}] = \mu' - \tilde{\mu}$$
$$= \frac{\hat{\tau}(\hat{\mu} - \tilde{\mu})}{\hat{\tau} + \tilde{\tau}} > 0 \tag{A5}$$

This expression illustrates the determinants of learning in the model. The impact on θ increases in both the signal mean and precision. The impact declines in the prior mean because people with low-mean priors have more scope to learn. It declines in the prior precision because people with precise priors place little weight on the signal.

The average treatment effect (ATE) of the intervention on hygiene is the average difference in e^* between the treatment and control groups: $E[e_{i1} - e_{i0}]$. We substitute Equations (A2) and (A4) into this expression to find the treatment effect on hygiene and define $\tilde{\delta} \equiv \phi + \alpha\tilde{\mu}$ and $\hat{\delta} \equiv \phi + \alpha\hat{\mu}$.

$$E[e_{i1} - e_{i0}] = \frac{\alpha\phi y\hat{\tau}(\hat{\mu} - \tilde{\mu})}{p\tilde{\delta}(\tilde{\tau}\tilde{\delta} + \hat{\tau}\hat{\delta})} > 0 \tag{A6}$$

Likewise, the ATE on health is $E[h_{i1} - h_{i0}] = h'^{*} - \tilde{h}^{*}$, which is weakly positive because $\frac{\tilde{\tau}\tilde{\mu}+\hat{\tau}\hat{\mu}}{\tilde{\tau}\tilde{\delta}+\hat{\tau}\hat{\delta}} > \frac{\tilde{\mu}}{\tilde{\delta}}$ and $\theta \geq 0$.

$$E[h_{i1} - h_{i0}] = \left(\frac{\alpha\phi y}{p}\right)^{\theta} s^{\gamma} \cdot \left[\left(\frac{\tilde{\tau}\tilde{\mu} + \hat{\tau}\hat{\mu}}{\tilde{\tau}\tilde{\delta} + \hat{\tau}\hat{\delta}}\right)^{\theta} - \left(\frac{\tilde{\mu}}{\tilde{\delta}}\right)^{\theta}\right] \geq 0 \tag{A7}$$

Equations (A6) and (A7) identify the factors that moderate compliance with an informational intervention. The health preference, α, and wealth, y, accentuate the impact on hygiene and health, while the preference for other consumption, ϕ, and the price of hygiene, p, reduce the impact.

A1.3 The Microscope Demonstration

The microscope demonstration shows participants that microbes exist, which is a necessary condition for the validity of the germ theory of disease. Let $M \geq 0$ represent exposure to the microscope demonstration. We assume that $\hat{\tau} = \hat{\tau}(M)$ and that $d\hat{\tau}/dM \geq 0$, so that the microscope demonstration makes hygiene instruction more convincing. The microscope demonstration may also increase $\hat{\mu}$ if facilitators offer direct signals about hygiene. We assume that $\hat{\mu} = \hat{\mu}(M)$ and that $d\hat{\mu}/dM \geq 0$ to permit this possibility.

The derivative of Equation (A5) with respect to M shows the effect of the microscope demonstration on θ.

$$\frac{dE[\theta_{i1} - \theta_{i0}]}{dM} = \underbrace{\left[\frac{\tilde{\tau}(\hat{\mu} - \tilde{\mu})}{(\hat{\tau} + \tilde{\tau})^2}\right] \frac{d\hat{\tau}}{dM}}_{+} + \underbrace{\left[\frac{\hat{\tau}}{\hat{\tau} + \tilde{\tau}}\right] \frac{d\hat{\mu}}{dM}}_{+} \geq 0 \tag{A8}$$

The first term of this expression is the effect through $\hat{\tau}$ and the second term is the effect through $\hat{\mu}$. Since both terms are weakly positive, the microscope demonstration strengthens the impact of hygiene instruction. The $\hat{\tau}$ channel is aligned with the motivation for the program, although we cannot rule out the $\hat{\mu}$ channel empirically. Analogous expressions for e^* and h^* are easy to obtain from this expression.

A1.4 The Role of Traditional Medicine

Beliefs in traditional medicine ($T \geq 0$) may moderate the impact of hygiene information. Traditional beliefs may foster the perception that hygiene is ineffective, so that $\tilde{\mu} = \tilde{\mu}(T)$ and $d\tilde{\mu}/dT \leq 0$. They may also reinforce preexisting beliefs that μ is low, so that $\tilde{\tau} = \tilde{\tau}(T)$ and $d\tilde{\tau}/dT \geq 0$. The derivative of Equation (A5) with respect to T shows how traditional medical beliefs moderate the treatment effect on θ.

$$\frac{dE[\theta_{i1} - \theta_{i0}]}{dT} = \underbrace{\left[\frac{\hat{\tau}(\tilde{\mu} - \hat{\mu})}{(\hat{\tau} + \tilde{\tau})^2}\right]\frac{d\tilde{\tau}}{dT}}_{-} + \underbrace{\left[-\frac{\hat{\tau}}{\hat{\tau} + \tilde{\tau}}\right]\frac{d\tilde{\mu}}{dT}}_{+} \gtrless 0 \tag{A9}$$

The first term of this expression (the effect through $\tilde{\tau}$) is negative because precise priors lead people to down-weight the signal. The second term (the effect through $\tilde{\mu}$) is positive because people with low values of $\tilde{\mu}$ have more room to learn. In order for Equation (A9) to be negative, traditional medicine must increase the precision of prior beliefs in the model.

The microscope demonstration may elicit a different response among believers and non-believers in traditional medicine. The cross-partial derivative of Equation (A5) with respect to M and T shows this effect.

$$\frac{\partial E[\theta_{i1} - \theta_{i0}]}{\partial M \partial T} = \underbrace{\left[\frac{(\hat{\mu} - \tilde{\mu})(\hat{\tau} - \tilde{\tau})}{(\hat{\tau} + \tilde{\tau})^3}\right]\frac{d\tilde{\tau}}{dT}\frac{d\hat{\tau}}{dM}}_{+/-} + \tag{A10}$$

$$\underbrace{\left[\frac{-\tilde{\tau}}{(\hat{\tau} + \tilde{\tau})^2}\right]\frac{d\tilde{\mu}}{dT}\frac{d\hat{\tau}}{dM}}_{+} + \underbrace{\left[\frac{-\hat{\tau}}{(\hat{\tau} + \tilde{\tau})^2}\right]\frac{d\tilde{\tau}}{dT}\frac{d\hat{\mu}}{dM}}_{-} \gtrless 0$$

This expression is complicated because M and T may operate through multiple channels. A negative sign for Equation (A10) is a sufficient condition for an effect of traditional medical beliefs on the prior precision. If we set $d\tilde{\tau}/dT = 0$ to zero out the prior precision channel, then the first and third terms disappear and the expression becomes positive.

A2 Microbe Literacy Curriculum

The Microbe Literacy program was developed by the South Asia Fund for Health and Education (SAFHE). For additional details about the program, please contact Edward Higgins (ed@safhe.org).

A2.1 Session 1: Microscope Demonstration

Participants are invited to sit comfortably. Microbe Literacy staff members register each participant. At the front of the group, a table and chair are positioned out of direct sunlight. The microscope is set up on the table and plugged in to 120-volt current. The CCTV camera is placed into one eyepiece, while a person is able to look through the other eyepiece. The CCTV camera will allow the image to be seen simultaneously on the monitor. Snacks and drinking water are provided.

- When everyone is assembled, Microbe Literacy staff introduce themselves and mention that the sponsor of the adult literacy class, The National Commission for Human Development, is also sponsoring this exploration of the world of very small animals. The facilitator asks participants to introduce themselves and say a bit about who is in their family.

- The facilitator describes the purpose of the workshop: (Something like) "Today we will take you the land of the very small – things too small to see with our eyes alone – where there are creatures that are just as real as the birds and other animals that we see every day. (The facilitator may want to be more specific about which animals are prominent in the participants' environment.) These very small creatures are all around us. Most of them will not hurt us, but a few can make us sick, so we need to know how to protect ourselves from them." The facilitator asks the participants if they have any thoughts or questions about this.

- Staff members distribute magnifying glasses around the group. The facilitator asks that the participants look at their hands and other objects through the magnifying glasses and notice what they see. The magnifying glasses are passed from participant to participant, so that everyone has a chance to look through them. Participants are asked to tell the group what they see through the magnifying glasses. The facilitator repeats the responses given by the participants and notes common themes, such as the magnifying glasses make things look bigger. She notes that the glass on the magnifying glass is curved on each side, and that is what makes what is being looked at look bigger.

- The facilitator takes one of the detachable lenses from the microscope table and passes it around among the participants. The facilitator points out that the lens is also made of curved glass, but that the microscope has more than one piece of glass and together they can make something too small to see with our eyes big enough to see through the microscope. Comments are elicited from the participants.

- Staff invite the participants to come up to the microscope table. Slides of preserved known objects – human hair, flies, bedbugs, etc – are put under the microscope and each participant is given the opportunity to look through the eyepieces and view the objects. The participants are shown how to adjust the focus and also move the object from side to side to see all of it. Participants are asked to describe what they see.

- The facilitator asks the participants to identify the smallest visible life form that they know of. This may be a pin worm or the mold (fungi) that forms on old bread. The facilitator acknowledges these. The facilitator then describes the bacterium. What the participants have seen through the microscope may be worms, fungi or parasites but will definitely include types of bacteria, given the power of the microscope. The facilitator notes that there is a very small life form called a virus that is too small for this microscope, but that also infects human beings. People will probably have heard of viruses.

- Microbe Literacy staff then look around the environment, and take a tiny sample of moist dirt, spoiled food, a speck from an open sewer or some other material likely to contain microbes. They ask a participant to assist. The sample is put on a glass slide, a drop of clean water is added, another slide placed on top and the sample placed under the microscope. Microbes will be seen moving about under their own locomotion.

- Each participant is invited to sit at the microscope, adjust the focus and move the sample from side to side to see other parts of it.

- Staff and participants collect other samples and put them under the microscope.

- ML staff note that microbes usually are found in places that are dark, damp and contain plenty of food. Staff and participants discuss other likely places to look for other samples to put under the microscope. The facilitator notes that microbes reproduce and spread very quickly if they have enough food.

- By this time, the participants and ML staff have enjoyed the adventure of capturing and viewing microscopic life forms from the environment, and it will be time to bring the session to a close. Staff and participants share their reactions to the experience.

A2.2 Infection-Prevention Workshop

The facilitator asks for comments and questions about what participants experienced during the first session and what they may have thought about since the first session. It is important not to rush through this portion, because it allows participants to resolve unanswered issues, share reactions with other participants, clear up possible misconceptions and venture articulating new ideas. It demonstrates that learning is a process that benefits from thinking out loud and open discussion. The facilitator notes how fast bacteria reproduce, and emphasizes that bacteria can reproduce as quickly inside the human body. The facilitator describes the purpose of this second workshop: how to prevent you, your children and other people at home from being infected by microbes in the environment.

- The facilitator observes that microbes are all around us, and that most of them will not harm human beings. Of those that do, they can only cause us harm if they get inside the human body. The facilitator notes the following ways microbes can enter the human body:

1. By mouth. We can eat food or drink water that has infectious microbes in it. Children can put infectious items in their mouths out of curiosity. The facilitator asks participants what kinds of infections/illness can be caused by ingesting infectious microbes. Terminology is discussed. If there are many words in the traditional lexicon for types of diarrhea, for example, the facilitator will note that regardless of type, all diarrhea, including so-called teething diarrhea, is caused by an infectious microbe being swallowed. The facilitator will suggest a single word be used that acknowledges microbial infection.

2. By nose and eyes. Infectious microbes can enter these parts of the body when we absentmindedly touch them with our hands when our hands may have microbes on them, or a breeze blows an infectious microbe into them. The infection may develop just in the eyes or nose, or reach the blood and be carried anywhere in our body. The facilitator asks participants what they call localized eye or nose infections, and what they look like and feel like.

3. Through broken skin. If we have a cut in our skin, infectious microbes touching the cut can enter the tissue and cause a localized infection or be taken anywhere in the body by the circulation of the blood. Another way that skin can be broken is through an insect bite, such as the bite of a mosquito. Certain insects carry infectious microbes and put them into our blood when they bite us. Intravenous needles that have been used by someone else will bring whatever microbe that person has in their blood into our blood. Some unofficial medical providers will offer to give IV injections, but their needles may have been used before by someone else. We should not take an IV needle unless it is given by a medical professional. Similarly, IV drug users who share needles are also sharing all of the microbes in their blood. The facilitator asks participants to describe what a cut that is infected looks like and feels like. Participants are asked to identify the kinds of insects that they believe carry infectious microbes, and to describe what an

infection caused by an insect bite looks like and feels like.

4. By breathing into the lungs. Infectious microbes can float in the air, particularly near a person who has a lung (respiratory) infection in an enclosed space without air flowing in and out through a window or door. If a person has been exposed to a lot of indoor smoke from a stove or to dust from some source, they are more likely to become infected when a microbe enters their lungs. The facilitator asks participants what they call lung infections, what they look like and feel like. The facilitator notes that lung infections can be caused by a number of bacteria, such as the one that causes tuberculosis, and by a number of viruses.

5. Through genital organs. A person with a sexually transmitted infection can give it to another person through sex. If bathing facilities contain infectious microbes or the opportunity to bathe is too infrequent, a person can receive an infection from an infectious microbe in the environment by accident. The facilitator will ask women if they know the names of sexually transmitted infections. They will discuss symptoms visible to either partner or felt by the infected person. Infections with no visible or felt symptoms (as above) are identified. Accidental infection through personal hygiene practices and inadequate bathing facilities is discussed, with the attendant risks of RTI and UTI. Women are led through a careful discussion of the symptoms both visible and felt of chronic RTI and UTI.

- The facilitator brings up the subject of how to prevent infectious microbes from entering the body. Participants are asked for suggestions. Each suggestion is related to one of the four points above. Participants own efforts to prevent infectious microbes from entering the body should be discussed thoroughly, as some may be proven effective and everyone should have a chance to learn about them. We want to add to people's skills, not replace them.

- The facilitator observes that there are three ways to prevent infectious organisms from entering our bodies: pushing them off our bodies or off items that will come in contact with our bodies by washing with soap and water or simply moving them away from us; killing them by boiling them, burning them, or using disinfectants; keeping them away by blocking access to ourselves or items we will come into contact with.

- The facilitator adds the further suggestions:
  - To prevent infectious microbes from entering our mouths. To protect the food we eat and the water we drink, animals such as birds and insects need to be kept away from food and water left open to the air. Birds and insects may land at some distance on human or animal waste, or on other material that has infectious microbes in it, then fly to kitchens and land on unprotected food and water, bringing infectious microbes on their feet. Food and water should be kept in containers with tight tops. If screening material is available, it can be used to screen off the food storage area.
  - Food and water need to be kept in containers that have been cleaned thoroughly with hot water and soap, and a disinfectant if necessary. We need to decide how long prepared food can be kept before it spoils, because of other infectious microbes that float through the air and land on food, where they start to grow. If we are not sure if the water we plan to drink or cook with does not have infectious microbes in it, we should boil it for a few minutes before using it, killing any infectious microbes. When cooking food, it should reach a temperature that is too hot to touch; when re-heating food, it should again reach a temperature that is too hot to touch.
  - To protect ones hands, which can bring infectious microbes from one place to another, one should wash with hot water and soap before cooking, after defecating and after handling childrens or animals waste, and both before and after tending to an ill person. Children must wash hands after defecating and before eating.

Fingernails should be kept short and free of debris.

- To prevent infectious microbes from entering our eyes and noses. This is primarily accomplished by making sure one does not touch ones eyes or nose if ones hands may have infectious microbes on them. If so, one should wash ones hands with hot water and soap. In addition, one should make sure a washcloth with which one washes ones face does not have infectious microbes on it.
- To prevent infectious microbes from entering through broken skin. Any break in the skin that shows blood should be carefully washed with clean hot water and clean soap, in order to push any microbes off the cut. If the cut is deep, and an inexpensive antiseptic (a disinfectant that is safe to put on an open cut) such as hydrogen peroxide is available, it should be applied to the cut. This will kill remaining infectious microbes. (If bleeding does not stop or if it is not clear that the washing and antiseptic have truly eliminated infectious microbes, the injured person should be taken to a medical professional.) After that, clean cloth or gauze should be taped or tied over the cut to prevent infectious microbes from the air or other people from settling in the open cut.
- The most dangerous biting insects that can transmit infectious microbes are mosquitoes, which carry malaria. Mosquito bites can be prevented most simply by investing in nets to sleep under, or screens to close off living areas. The community as a whole may also investigate the pools of standing water where mosquitoes breed, and either drain them or treat them with non-toxic insecticide.
- To prevent infectious microbes from entering the lungs. An ill person who is sneezing and coughing in an enclosed space is releasing infectious microbes attached to tiny water droplets in the air, and these can be breathed in by those nearby, causing infection. These droplets do not travel far, and can be avoided by minimizing close contact with the ill person. A person who is tending to the ill person should make sure the room where the ill person is located is open to

sufficient breeze from one side to move the water droplets from the ill persons sneezing and coughing to the outside, and from the opposite side to move fresh air in.

  - Repeated exposure to dust or smoke from weaving or other manufacture can bring small particles into the lungs, causing inflammation which in turn make lungs more vulnerable to infection from microbes being inhaled. Interior rooms with high concentrations of dust or smoke should be well ventilated from two sides. Children should not be exposed to high concentrations of dust and smoke or they will be subject to repeated or chronic lung infections.
  - To prevent microbes from entering the genital organs. For both men and women, the simplest way of avoiding infection from a sexual partner who is infected is not to have sex with that person. The second best preventive measure is for men to use a condom. For women, preventing accidental infection means that frequent bathing with clean, hot water and soap should be made available.
  - Questions and discussion are elicited from participants. The facilitator asks participants to review with him/her the five ways microbes can enter the human body. Ways of preventing the first four ways of infection are reviewed jointly. The facilitator suggests that mothers and fathers discuss ways of preventing infection through the fifth path when they are home together.

- When your child has diarrhea:
  - Diarrhea is caused by microbes entering the child's stomach and digestive tract, and reproducing at a high rate. The microbes are feeding off the child's internal organs and causing damage to them. No matter what the diarrhea looks like – watery, bloody, explosive, etc. – it is caused by an infection of microscopic organisms.
  - In many cases, your child's body will gradually fight off and destroy the microbes,

but before that the diarrhea she experiences drains a large amount of water from her body. She is at risk of dying from dehydration, loss of water from the body. (Our bodies are mostly water and will die if too much water is lost.) In addition, she is losing most of the value of food that she eats and other essentials such as salt.

- Two things must be done when a child is suffering from diarrhea. First, we must continue to give her food, including breast milk – in fact she needs more than usual. We must also replace the water that the child loses from diarrhea by giving her more water in the form of ORS, oral rehydration salts. This can be made at home by combining:

  1. 1/2 cup of dry, precooked baby rice cereal
  2. 2 cups of water (has to be boiled first, then cooled)
  3. 1/4 teaspoon salt

  If you have a WHO ORS packet:

  1. Boil and cool 1 liter of water
  2. Dissolve one packet in the water

- Some people advocate adding some animal fat or vegetable oil to any ORS to give your child more energy to fight off the infection.

- ORS should be given to you child every day until the diarrhea ceases and she can eat and drink normally. But if the diarrhea does not stop after BLANK days, you should take her to a medical professional.

- Facilitators ask participants if they have used ORS before, and what their experience was of its effectiveness. Previous experience with ORS should be explored carefully to see what preparation the mother used, how often she used it, what other factors were involved–whether she continued to breastfeed a small baby, whether the water was boiled, how long she started it after the child developed diarrhea, etc. Facilitators do not want to leave doubts about the effectiveness of ORS.

  - Facilitators review with participants the basics of ORS, and whether each participant has the items necessary to make repeated batches of ORS in the event a child develops diarrhea.

- In the last phase of the second session, the Microbe Literacy facilitators raise the question of how the participants think that they can put into practice what they have seen and learned. Ideas are elicited. Of all the ideas elicited, two can be highlighted:

- Participants can visit each other in their home compounds and see what the other person is doing to prevent infections in her family. Groups of participants who live near each other can continue to meet, either at someones home, or in another location, to make sure each of them puts into practice the preventive measures discussed and uses ORS when it is called for. If the teacher or a Lady Health Worker is available, that person can help the group meet and use their new knowledge.

- The adult literacy teacher will have information available on infection prevention and other health issues for the participants to use after the ML workshops have been completed.

- Facilitators note that this is the end of the second workshop of the two. Comments about what the participants have learned are elicited. Advice about what learning experiences were effective and what were not effective are asked for so that future workshops can be made better.

A3 Attrition and Missing Data

This section discusses attrition and our approach to missing data. Table A1 shows the rates of attrition for respondents and children by round and treatment arm. The baseline sample includes 4032 ALC participants who responded to the baseline survey in May of 2013. After the intervention in June and July, we conducted a three-month midline survey in August and September of 2013. Midline attrition, which is uncorrelated with treatment, was around 5 percent for respondents and around 7 percent for children. We conducted a sixteen-month endline survey in October and November of 2014. Endline attrition was 15 percent for respondents and 29 percent for children. A catastrophic flood in Muzaffargarh District prior to the endline survey increased attrition by making it impossible survey in 10 ALCs, which contained 197 respondents and 166 children. The flood was localized to these ALCs and did not affect data collection elsewhere. The flood happened disproportionately in IO and C ALCs, leading to extra attrition in these arms. The flood was responsible for endline attrition of 1.5 percent in ML, 5.9 percent in IO, and 7.5 percent in C among respondents. It was responsible for endline attrition of 1.9 percent in ML, 9.7 percent in IO, and 9.9 percent in C among children. Therefore non-flood attrition is uncorrelated with treatment. Sample means (available from the authors) show that baseline characteristics and outcome variables are similar for flood-affected and unaffected samples.

We handle missing observations using listwise deletion. Regressions are based on a common sample that has no missing observations across hygiene, sanitation, health, and traditional medical belief outcomes. This restriction leads to a loss of 141 respondent observations and 55 child observations across both the midline and endline rounds. For anthropometric outcomes, we also omit children whose WAZ and HAZ values are biologically implausible according to the WHO because they fall outside the range of -6 to 6. This step leads to the exclusion 365 observations from anthropometric estimates, primarily due to extreme height values. Surveyors confirm that they had difficulty measuring the height of young children who could not stand on their own, which is consistent with the age pattern of extreme height observations. Estimates that include extreme anthropometric outcomes are available from the authors and closely resemble (but are larger and more statistically significant) than the results that we report. By providing baseline characteristics of the endline *estimation* *sample*, Table 1 shows that most demographic characteristics and outcomes are balanced at baseline after we account for attrition and missing data.

A4 Sample Selection

This section discusses the representativeness of the study sample. We enrolled participants in existing ALCs from four districts in southern Punjab Province. Since the adult literacy program targets women without formal schooling, this sampling frame may have selected people with low socioeconomic status. To assess this issue, Table A2 compares the study sample to a representative sample of rural Punjab women aged 15−70 from the 2011 Multiple Indicator Cluster Survey (MICS). We report all variables from Table 1 that the surveys measure comparably. Columns 1 and 2 show means for the study sample and the MICS sample, and Column 3 shows the p-value of the difference. MICS sample means incorporate household probability weights to reflect the sampling methodology. Only 11 percent of study participants have formal schooling, compared to 42 percent of rural Punjab women. Study participants are 7.3 years younger than average and are 10 percentage points less likely be married. They are 22 percentage points more likely to work outside the home. Their children also have significantly worse health outcomes.

We examine whether these differences matter by estimating a specification that interacts ML and IO with the twelve respondent characteristics in the table. Then we use the study sample and MICS sample means of these characteristics to predict the overall impacts of ML and IO.[1] These predictions are not equivalent to average treatment effects, however a comparison of the study sample and MICS predictions suggests whether estimates in the paper are likely to generalize to a representative sample.

Table A3 compares impact predictions for the study sample and the MICS sample. As a benchmark, the first row provides a comparable treatment effect estimate using the

[1] The regressions pool the midline and endline rounds. We create quartile indicators for all non-binary characteristics (age, household size, number of bedrooms, and land).

methodology in the paper. The second and third rows show impact predictions for the study sample and the MICS sample. The study sample predictions closely resemble the treatment effect estimates. For instance, the predicted effect of ML on respondent hygiene is 0.13 while the actual treatment effect estimate is 0.15. The model predicts very similar effects on respondent hygiene and health in the study sample and the MICS sample. Both the treatment effects and predictions for child health are insignificant. The largest discrepancy between the samples occurs for child WAZ, in which the MICS prediction is close to zero. This discrepancy mostly arises from the large negative (but statistically insignificant) interactions between ML and respondent age and education, which are higher in the MICS sample. These results suggest that the impacts on respondent hygiene and health are likely to generalize while the impact on child weight may not.

ALC participants, who have chosen to seek human capital, may also have unusual levels of motivation, learning ability, or autonomy. One concern is that impacts could be weaker among people who have not sought human capital. Selection is likely to be mild in practice because the NCHD works hard to recruit all eligible women in the communities where it offers classes. To investigate further, we assess whether ALC academic performance moderates the impact of ML. Academic performance is a noisy proxy for the utility of ALC participation. ALC participants take three literacy tests and one mathematics test during the six-month course, most of which precede the intervention. We only have test data for 68 percent of the sample due to incomplete NCHD records, however intervention impacts are similar for respondents with missing and non-missing scores. We compute the mean test score and change from the first to the last test score for each available respondent. Both variables are standardized to have a mean of zero and a standard deviation of one.

Table A4 shows the interaction between ML and the mean test score (Panel A) and the test score change (Panel B). Since scores are standardized, the ML coefficient represents the treatment effect for someone with an average score or change in score. Test score interactions are small and statistically insignificant. In Column 1 of Panel A, a 1σ test score improvement increases the hygiene impact by 0.02 points, which is not statistically significant. Other estimates in the table are similarly modest and have conflicting signs. These results suggest that academic ability does not heavily moderate the impact of ML, which mitigates the selection concern.[2]

A5 Hygiene Measurement

This subsection further justifies the use of personal appearance as a hygiene proxy. Observation of personal appearance is a form of rapid surveyor observation, which Ram (2010) argues is often the best way to measure hygiene. Hygiene self-reports are problematic because people have a strong incentive to misreport. For instance, 96 percent of respondents report washing their hands after defecating although only 29 percent have hand washing stations. Structured observation, an alternative in which surveyors observe behavior over longer intervals, is subject to Hawthorne effects. Hand rinse cultures that indicate fecal hand contamination are noisy and difficult to collect (Ram et al. 2011).

We may nonetheless worry about the informational content of personal appearance. Surveyors could have surmised treatment status from minor variations in the questionnaire and scored ML respondents more leniently, or ML respondents might have differentially "cleaned up" before being interviewed. These concerns pose only a minimal threat for several reasons. As employees of an established survey firm, surveyors did not have a financial incentive to misreport their observations. We carefully trained surveyors and provided sample images with the questionnaire to reduce the scope for subjective interpretation. Field team leaders conducted back check interviews with a five-percent subsample of respondents. Original and back check hygiene observations agree in around 90 percent of cases.

Estimates could be biased if idiosyncrasies in surveyors' perceptions of cleanliness happen to be correlated with treatment. This issue does not seem evident in the baseline since

[2]This table does not adjust significance levels for multiple hypothesis testing because unadjusted p-values for the test score interactions are already insignificant.

hygiene is balanced. Regressions with surveyor fixed effects also address this concern. These results (available from the authors) are noisy but otherwise resemble the results in the paper. Next we consider whether ML participants might have differentially cleaned up before being interviewed. Field reports do not suggest that this behavior was common. As another check, we compare effects for respondents who are interviewed early and late in the survey team's visit to the village. Although late interviewees have a greater opportunity to adjust their appearance, we find that these groups have almost identical hygiene effects, mitigating this concern.

Regardless of measurement, a person's appearance might be only weakly correlated with hygiene behavior. We investigate this possibility by correlating personal appearance with other hygiene and sanitation indicators in Table A5. The unweighted sum of the cleanliness of hands, fingernails, feet, and clothing is an alternative hygiene indicator for respondents. Respondent appearance ("respondent hygiene") is strongly correlated with the other indicators in the table. The correlation coefficient is 0.52 with the cleanliness of the cooking area, 0.31 with the presence of soap, and 0.33 with the absence of garbage. In contrast, self-reported handwashing after defecation is only weakly correlated with other outcomes. This pattern suggests that personal appearance captures relevant hygiene variation.

The correlation between hygiene and health impacts offers another validity check. As in Figure 6, we jointly bootstrap the impact of ML on hygiene, sanitation, and health, which allows us to correlate the treatment effects of ML on different outcomes across bootstrap replications (Fox 2015, Ch. 21).[3] Without establishing causality, this approach sheds light on the hygiene and sanitation variables that are most closely associated with the impact on health. A behavior is unlikely to be important to the causal chain if the impact on the behavior is uncorrelated with the impact on health.

Table A6 shows the correlation between the behavior and health outcomes in our analysis. Bootstrap replications with strong health impacts also tend to exhibit strong hygiene

[3]We implement a cluster bootstrap of randomization groups. This approach internalizes village hygiene externalities, which may magnify the correlation between hygiene and health impacts.

impacts. Column 1 shows that the impact of ML on respondent health is strongly correlated with the impact on all five indicators of respondent appearance ($\rho \geq 0.38$). Impacts on child weight and height are also strongly associated with the impact on respondent hygiene. Sanitation outcomes have a much weaker association with health and child anthropometrics in this analysis. The strong correlation between hygiene and health further validates personal appearance as a hygiene proxy.

A6 Disaggregated Health Estimates

The paper shows impacts on the health index, which aggregates self-reported morbidity due to diarrhea, fever, and cough within the past two weeks. Here we show impacts on diarrhea, fever, and cough separately. The disaggregated approach illustrates which morbidities contribute to the health impact and facilitates a comparison to other hygiene promotion studies, which often distinguish between diarrhea and respiratory illness (Fewtrell et al. 2005, Aiello et al. 2008).

Table A7 provides estimates for diarrhea, fever, and cough separately for respondents (Columns $1-3$) and for children under five (Columns $3-6$). The table provides multiple-testing adjusted p-values and significance levels. The (statistically-insignificant) point estimates in Columns 1 and 4 indicate that ML reduces respondent diarrhea by 3.0 percentage points (30 percent) at midline and by 2.4 percentage points (24 percent) at endline. It reduces child diarrhea by 1.3 percentage points (6 percent) at midline and by 3.2 percentage points (15 percent) at endline. The impacts on fever and cough are stronger, particularly for respondents. ML reduces respondent fever by 12 percentage points in the midline and by 10 percentage points in the endline. It reduces respondent cough by 6 percentage points in both rounds. The stronger anthropometric effects in Table 4 suggest that the measurement error may attenuate the child morbidity estimates. Systematic failure by respondents to recall some instances of child morbidity may mitigate the difference between treatment arms.

A7 Control Group Contamination

Information spillovers across treatment arms could bias treatment effect estimates downward by improving hygiene in the control arm. The design minimizes the potential for spillovers by clustering ALCs into geographically distinct randomization groups. The conservative social context and specifically the practice of purdah also limit spillovers by restricting female autonomy and mobility. We consider this issue further by isolating control respondents who are the least likely to have learned from the intervention. In the midline survey, eight percent of control respondents said they were aware of a recent microscope event. Half of control respondents live within three kilometers of an ML or IO ALC. There are no differences in follow-up hygiene and health between aware and unaware control respondents. Follow-up hygiene and health are 0.11 points higher and 0.10 points higher respectively for control respondents who live near treatment (both differences are insignificant).

Table A8 reestimates our main regressions without control respondents who live nearby or indicate awareness the intervention. Results resemble the estimates in the paper in terms of both magnitude and significance. We now find midline and endline hygiene impacts of 0.12 and 0.17, compared to impacts of 0.14 and 0.16 in Table 2. TBI_{H} interaction estimates (available from the authors) are also robust to excluding these respondents. These findings minimize the concern that information spillovers could substantially affect our estimates.

A8 The Impact on Hygiene Knowledge

This section shows evidence of the impact of ML on hygiene knowledge. Respondents were asked to agree or disagree with the following four statements, all of which are false: (Q1) "I can tell if my hands are clean just by looking at them"; (Q2) "Untreated water is safe to drink"; (Q3) "It is safe to eat food that has been touched by flies"; and (Q4) "The worst thing diarrhea can do is make a child uncomfortable." We record whether the respondent answered correctly, as well as the total number of correct responses.[4] We estimate impacts with a "value-added" specification, in which the dependent variable is the change in knowledge from baseline (Rivkin et al. 2005, Meghir and Rivkin 2011). This approach, which is common in the education literature, constrains the coefficient on the baseline dependent variable to equal one and addresses baseline imbalance by estimating the impact on the change instead of the level.[5]

Table A9 shows treatment effects on hygiene knowledge. In Column 1, ML increases the number of correct responses by 0.24 in the midline and by 0.16 in the endline (an insignificant result). The impact of IO is $18-34$ percent smaller and is insignificant in both rounds. Columns 2 and 3 show that ML increases the perception that hands may be dirty regardless of appearance (Q1) and that untreated water may be unsafe (Q2) by 9 percentage points each in the midline survey. While the impact on the number of correct responses is statistically significant, the separate estimates for Q1−Q4 are not significant after adjusting for multiple testing. The impact on Q1 dissipates but the impact on Q2 strengthens in the endline survey. ML also raises awareness that diarrhea may be harmful (Q4) but does not change perceptions of the danger of contamination by flies (Q3). Of the four items, Q1 and Q2 relate most directly to the role of microbes as disease agents. The larger impact on these questions suggests that the microscope demonstration works by raising awareness of microbes.

Table A10 estimates the interaction between treatment and traditional medical beliefs for hygiene knowledge. As in Table 7 of the paper, Columns $1-4$ show results under

[4]Unfortunately these variables are problematic for two reasons. First, Q1 and Q2 are imbalanced in the baseline, with ML respondents scoring significantly worse. Regressions that do not adequately address this imbalance may be biased downward. Secondly, Q1 and Q4 exhibit a downward time trend, suggesting that respondents become *less* informed over time. This pattern could reflect seasonality in the interpretation of these questions. For instance, respondents might answer Q4 differently during the monsoon period (when we conducted the endline survey) if they perceive that diarrhea is more harmful at that time. Ultimately, knowledge is difficult to elicit reliably. Behavior change may be a more dependable measure of learning from an informational intervention.

[5]In the alternative specification that controls for the baseline dependent variable, serial autocorrelation may bias the treatment effect estimate under baseline imbalance because treatment and the baseline dependent variable are correlated.

alternative TBI definitions while Columns $4-8$ control for the interaction of treatment with baseline covariates. The TBI interaction is strongly negative and significant. ML improves the knowledge of low-TBI respondents by 0.40 points but only improves the knowledge of high-TBI respondents by 0.06 points. This pattern is stable across alternative TBI definitions and is robust to including the interaction of treatment with baseline covariates. Separate estimates for Q1−Q4 (available from the authors) show significant TBI_H interactions for Q1 and Q2 but not for Q3 and Q4. Since Q1 and Q2 relate most directly to the role of microbes, this pattern suggests that traditional beliefs specifically interfere with learning about microbes.

A9 Additional TBI Interaction Estimates

This section provides additional evidence of the robustness of the TBI_H interactions in Section 5 of the paper. We complement our primary hygiene results in Table 7 by showing TBI_H interaction estimates for the unweighted sum of the cleanliness of respondents' hands, fingernails, feet, and clothes, an alternative hygiene outcome. We normalize this variable, which is only available at endline, to match the mean and standard deviation of the primary hygiene variable. The correlation between these two indicators is 0.61.

Table A11 shows estimates for the alternative hygiene outcome. A comparison to Table 7 shows that TBI_H interaction coefficients closely resemble our earlier results in terms of both magnitude and significance. As before, Columns $2-4$ show that the result is robust under three alternative TBI definitions and Columns $5-8$ show that estimates are insensitive to controlling for the interaction between treatment and baseline covariates. Disaggregated estimates for the cleanliness of hands, fingernails, feet, and clothes show the same pattern.

Next we show TBI_H interaction estimates for health and anthropometric outcomes. Table 8 in the paper reports estimates from our primary specification but does not examine other TBI definitions or control for the interaction of treatment with covariates. Table A12 provides these estimates for each dependent variable and alternative specification. Each cell of the table shows the coefficient on $\text{ML} \cdot \text{TBI}_{\text{H}}$, and the first row reproduces the results from Table 8. Rows $2-4$ show that the three alternative TBI definitions yield similar results. Rows $5-8$ show that results are robust if we control for the interaction of treatment with baseline covariates. These controls are jointly significant with $p < 0.001$ in all specifications.

Table A1: Sample Sizes and Attrition by Round and Treatment Arm

	Microbe Literacy		Instruction Only		Control	
	N	Attr. (%)	N	Attr. (%)	N	Attr. (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Respondents						
Baseline	1351	-	1390	-	1291	-
Midline	1285	0.05	1333	0.04	1218	0.06
Endline	1203	0.11	1153	0.17	1052	0.19
Panel B: Children ≤ 5						
Baseline	792	-	789	-	795	-
Midline	738	0.07	737	0.07	745	0.06
Endline	615	0.22	551	0.30	522	0.34

Table A2: Sample and Population Characteristics

	Mean		P-Value
	Study	MICS	(1)−(2)
	(1)	(2)	(3)
Age (respondent)	26.2	33.5	0.00***
Any schooling	0.11	0.42	0.00***
Married	0.55	0.65	0.00***
Household size	7.0	7.4	0.00***
Improved roof	0.84	0.78	0.00***
Bedrooms	2.2	2.2	0.65
Land (acres)	3.4	5.7	0.00***
Animals	0.67	0.67	0.96
Works outside the home	0.34	0.12	0.00***
Electricity	0.93	0.93	0.96
Refrigerator	0.27	0.41	0.00***
Mobile phone	0.85	0.85	0.96
Child diarrhea	0.32	0.17	0.00***
Child cough	0.24	0.10	0.00***

Note: The table compares the study sample to a representative sample of rural Punjab women aged 15-70 from the 2011 Multiple Indicator Cluster Survey (MICS). We use household probability weights to compute the means in Column 2 and the p-values in Column 3. P-values in Column 3 are based on a regression with standard errors that are clustered by PSU/randomization group. For respondent outcomes, $n = 3777$ in Column 1 and $n = 106,172$ in Column 2. For child diarrhea and cough, $n = 1698$ in Column 1 and $n = 41,444$ in Column 2. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Predicted Impacts for the Study Sample and a Representative Sample of Rural Women

	Resp.	Health Index		Child Anthropometrics	
	Hygiene	Resp.	Children	WAZ	HAZ
	(1)	(2)	(3)	(4)	(5)
Treatment effect estimate	0.15***	0.20***	0.06	0.30	0.33*
Study sample prediction	0.13***	0.19***	0.05	0.32**	0.32*
MICS sample prediction	0.12**	0.18***	0.10	0.02	0.19
P-value: study−MICS	0.02	0.00	0.45	0.01	0.15
P-value: ML interactions	0.02	0.02	0.49	0.00	0.16

Note: All estimates pool the midline and endline rounds. Impact predictions are based on a specification with interactions between ML and the 12 respondent characteristics in table A2. We use the study sample and MICS sample frequencies of these characteristics to predict the overall impact of ML in these samples. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: The Interaction Between Microbe Literacy and Academic Performance

	Resp. Hygiene	Health Index		Child Anthropometrics	
		Resp.	Children	WAZ	HAZ
	(1)	(2)	(3)	(4)	(5)
Panel A: Score Interaction					
Microbe Literacy	0.13**	0.21***	0.040	0.31	0.19
	(0.051)	(0.057)	(0.055)	(0.19)	(0.17)
Microbe Literacy · Std. Test Score	0.018	0.039	-0.048	0.066	-0.089
	(0.033)	(0.041)	(0.043)	(0.19)	(0.17)
Panel B: Change-in-Score Interaction					
Microbe Literacy	0.14***	0.21***	0.045	0.23	0.18
	(0.052)	(0.057)	(0.054)	(0.19)	(0.18)
Microbe Literacy · Std. ΔTest Score	0.015	-0.0031	-0.029	-0.10	0.27
	(0.027)	(0.040)	(0.048)	(0.18)	(0.17)

Note: Clustered standard errors appear in parentheses. The table reports unadjusted p-values. All regressions control for strata dummies and round dummies. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Correlation Among Hygiene and Sanitation Outcomes

	Respondent Hygiene	Alt. Respondent Hygiene	Child Hygiene	Handwash Self-Report	Lack of Defecation	Lack of Garbage	Clean Cooking Area
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Alt. respondent hygiene	0.61	-	-	-	-	-	-
Child hygiene	0.44	0.51	-	-	-	-	-
Handwash self-report	0.15	0.15	0.11	-	-	-	-
Lack of defecation	0.20	0.33	0.23	0.06	-	-	-
Lack of garbage	0.33	0.39	0.37	0.02	0.58	-	-
Clean cooking area	0.52	0.53	0.38	0.10	0.22	0.32	-
Soap present	0.31	0.22	0.24	0.06	0.03	0.13	0.36

Note: The table reports correlation coefficients for the control group in the endline survey.

Table A6: The Bootstrap Correlation Between Behavior and Health Impacts of ML

	Health Index		Child Anthropometrics	
	Respondent	Children	WAZ	HAZ
	(1)	(2)	(3)	(4)
Respondent hygiene	0.41	0.13	0.28	0.23
Hand hygiene	0.39	0.13	0.10	0.23
Fingernail hygiene	0.44	0.19	0.13	0.26
Feet hygiene	0.38	0.10	0.14	0.34
Clothes hygiene	0.46	0.18	0.18	0.20
Child hygiene	0.26	0.06	0.12	0.15
Lack of open defecation	-0.03	-0.07	-0.09	0.01
Lack of garbage	0.26	0.02	0.11	0.16
Clean cooking area	0.05	-0.11	0.08	0.13
Soap present	0.03	-0.06	0.13	0.08

Note: the table provides correlation coefficients between impacts of ML for behavior outcomes (rows) and health outcomes (columns). We jointly bootstrap treatment effect estimates for all outcomes in the table and compute the correlation between the ML coefficients for each pair of outcomes across bootstrap replications.

Table A7: The Impact on Self-Reported Morbidity for Respondents and Children

	Respondents			Children		
	Diarrhea	Fever	Cough	Diarrhea	Fever	Cough
	(1)	(2)	(3)	(4)	(5)	(6)
Midline · Microbe Literacy	-0.032	-0.12**	-0.058**	-0.0096	-0.048	-0.036
	(0.023)	(0.040)	(0.019)	(0.029)	(0.036)	(0.021)
Midline · Instruction Only	-0.0087	-0.063	0.0087	0.026	-0.023	0.0023
	(0.024)	(0.040)	(0.022)	(0.028)	(0.036)	(0.022)
Endline · Microbe Literacy	-0.022	-0.094*	-0.060	-0.045	0.0071	-0.015
	(0.017)	(0.035)	(0.033)	(0.029)	(0.042)	(0.045)
Endline · Instruction Only	-0.0020	-0.033	-0.021	-0.023	-0.034	-0.032
	(0.020)	(0.031)	(0.036)	(0.030)	(0.038)	(0.043)
P-value: ML−IO (mid)	0.43	0.35	0.00	0.52	0.46	0.31
P-value: ML−IO (end)	0.56	0.37	0.54	0.69	0.64	0.70
Dependent variable mean (C)	0.10	0.31	0.21	0.21	0.31	0.23
Observations	7104	7104	7104	4984	4894	4894

Note: Clustered standard errors appear in parentheses. The table reports multiple-testing adjusted p-values and significance levels. Hypotheses are grouped by row, as we describe in the text. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Robustness to Possible Control Group Contamination

	Respondent Hygiene	Health Index: Respondent	Health Index: Children	Child Anthropometrics: WAZ	Child Anthropometrics: HAZ	TBI
	(1)	(2)	(3)	(4)	(5)	(6)
Midline · Microbe Literacy	0.15*	0.25**	0.049	-	-	-0.24**
	(0.076)	(0.10)	(0.096)			(0.092)
Midline · Instruction Only	0.051	0.12	-0.048	-	-	-0.17
	(0.075)	(0.10)	(0.094)			(0.10)
Endline · Microbe Literacy	0.19***	0.16	0.062	0.40	0.45	-0.0099
	(0.074)	(0.090)	(0.11)	(0.24)	(0.27)	(0.084)
Endline · Instruction Only	0.066	0.055	0.11	0.22	0.32	-0.0094
	(0.071)	(0.085)	(0.11)	(0.25)	(0.27)	(0.078)
P-value: ML−IO (mid)	0.13	0.09	0.20	-	-	0.22
P-value: ML−IO (end)	0.03	0.33	0.64	0.68	0.73	0.99
Dependent variable mean (C)	2.21	2.33	2.31	-2.06	-2.61	1.39
Observations	5684	5684	3845	1135	1135	5684

Note: Clustered standard errors appear in parentheses. All estimates exclude control respondents who indicate awareness of the intervention or who live within 3 kilometers of an ML or IO ALC. P-values and significance levels in Columns $2-5$ are adjusted for multiple hypothesis testing. Hypotheses are grouped by row, as we explain in the text. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: The Impact on Hygiene Knowledge

	ΔTotal	ΔQ1	ΔQ2	ΔQ3	ΔQ4
	(1)	(2)	(3)	(4)	(5)
Midline · Microbe Literacy	0.25***	0.098	0.089	-0.0015	0.063*
	(0.085)	(0.051)	(0.052)	(0.037)	(0.026)
Endline · Microbe Literacy	0.15	0.017	0.099	-0.0069	0.041
	(0.10)	(0.065)	(0.064)	(0.044)	(0.029)
Midline · Instruction Only	0.12	0.056	0.015	0.013	0.035
	(0.095)	(0.057)	(0.056)	(0.031)	(0.032)
Endline · Instruction Only	0.080	0.030	0.035	-0.0026	0.017
	(0.097)	(0.062)	(0.064)	(0.038)	(0.036)
P-value: ML−IO (mid)	0.17	0.74	0.49	0.70	0.72
P-value: ML−IO (end)	0.59	0.90	0.75	0.95	0.94
Dependent variable mean (C)	-0.10	-0.26	0.17	0.11	-0.13
Observations	6744	6744	6744	6744	6744

Note: Clustered standard errors appear in parentheses. Multiple-testing adjusted p-values appear in Columns $2-5$. Hypotheses are grouped by row, as we describe in the text. Columns $2-5$ show the probability that the respondent *disagrees* with (i.e. responds correctly to) four statements. Q1: "I can tell if my hands are clean just by looking at them." Q2: "Untreated water is safe to drink." Q3: "It is safe to eat food that has been touched by flies." Q4: "The worst thing diarrhea can do is make a child uncomfortable." Column 1 shows the sum of correct responses. All regressions show the impact on the difference from baseline in the dependent variable. All regressions control for strata dummies and round dummies. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: The Interaction Between Microbe Literacy and Traditional Beliefs for Hygiene Knowledge

	Hygiene Knowledge (ΔTotal)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Microbe Literacy	0.41***	0.41***	0.41***	0.41**	0.58*	0.23	0.12	0.062
	(0.15)	(0.15)	(0.15)	(0.16)	(0.33)	(0.39)	(0.64)	(0.70)
Microbe Literacy · TBI_H	-0.36**	-0.36**	-0.36**	-0.34**	-0.35**	-0.29*	-0.35**	-0.31**
	(0.16)	(0.16)	(0.16)	(0.17)	(0.15)	(0.15)	(0.16)	(0.14)
Instruction Only	0.10	0.11	0.10	0.10	0.41	0.38	-0.14	0.16
	(0.14)	(0.14)	(0.14)	(0.14)	(0.29)	(0.36)	(0.54)	(0.60)
Instruction Only · TBI_H	0.012	0.0022	0.0093	0.0059	0.022	0.032	0.017	0.038
	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.16)	(0.17)	(0.16)
P-value: $[ML \cdot TBI_H] - [IO \cdot TBI_H]$	0.03	0.04	0.03	0.04	0.02	0.04	0.03	0.02
P-value: Controls	-	-	-	-	0.00	0.00	0.00	0.00
TBI definition	Main	PC	Summary	Broad	Main	Main	Main	Main
Demo and economic controls	-	-	-	-	Yes	-	-	Yes
Hygiene and health controls	-	-	-	-	-	Yes	-	Yes
Literacy test score controls	-	-	-	-	-	-	Yes	Yes
Dependent variable mean (C)	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
Observations	6744	6744	6744	6744	6744	6744	6744	6744

Note: Clustered standard errors appear in parentheses. The table reports unadjusted p-values. All regressions control for strata dummies and round dummies. Estimates pool the midline and endline rounds. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A11: TBI Interactions for an Alternative Hygiene Proxy

	Respondent Hygiene (Alternative)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Microbe Literacy	0.28***	0.28***	0.29***	0.28***	0.15	0.19	0.25	-0.011
	(0.088)	(0.090)	(0.088)	(0.090)	(0.19)	(0.25)	(0.36)	(0.43)
Microbe Literacy · TBI_H	-0.20**	-0.19**	-0.21**	-0.18*	-0.14	-0.19**	-0.16*	-0.11
	(0.095)	(0.095)	(0.095)	(0.093)	(0.087)	(0.090)	(0.091)	(0.079)
Instruction Only	-0.072	-0.081	-0.068	-0.071	-0.17	-0.20	-0.20	-0.24
	(0.078)	(0.079)	(0.077)	(0.081)	(0.17)	(0.21)	(0.31)	(0.37)
Instruction Only · TBI_H	0.060	0.073	0.054	0.054	0.053	0.058	0.086	0.079
	(0.081)	(0.078)	(0.080)	(0.082)	(0.079)	(0.080)	(0.079)	(0.075)
P-value: $[ML \cdot TBI_H] - [IO \cdot TBI_H]$	0.01	0.00	0.00	0.01	0.02	0.01	0.01	0.02
P-value: Controls	-	-	-	-	0.00	0.00	0.00	0.00
TBI definition	Main	PC	Summary	Broad	Main	Main	Main	Main
Demo and economic controls	-	-	-	-	Yes	-	-	Yes
Hygiene and health controls	-	-	-	-	-	Yes	-	Yes
Literacy test score controls	-	-	-	-	-	-	Yes	Yes
Dependent variable mean (C)	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Observations	3188	3188	3188	3188	3188	3188	3188	3188

Note: Clustered standard errors appear in parentheses. All regressions control for strata and round dummies. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Estimates of the ML $\cdot$ TBI_H Interaction for Health with Controls

	Health Index		Child Anthropometrics	
	Respondent	Children	WAZ	HAZ
	(1)	(2)	(3)	(4)
Original estimates	-0.093	-0.011	-1.14***	-1.24***
	(0.081)	(0.11)	(0.30)	(0.31)
Alternative TBI Definitions				
Principal component	-0.081	-0.001	-1.03**	-1.03**
	(0.078)	(0.12)	(0.30)	(0.33)
Summary index	-0.096	-0.019	-1.14***	-1.23***
	(0.080)	(0.11)	(0.30)	(0.31)
Broad index	-0.069	0.019	-1.41***	-1.29***
	(0.081)	(0.12)	(0.31)	(0.30)
Control for Treatment · Covariates				
Demo and economic controls	-0.036	0.041	-1.08***	-1.37***
	(0.076)	(0.11)	(0.28)	(0.31)
Hygiene and health controls	-0.089	-0.011	-1.25***	-1.26***
	(0.077)	(0.11)	(0.32)	(0.32)
Test score controls	-0.092	0.013	-1.13***	-1.00**
	(0.074)	(0.11)	(0.29)	(0.32)
All controls	-0.045	0.045	-1.10***	-1.16**
	(0.067)	(0.11)	(0.30)	(0.34)
Observations	7104	3945	1424	1424

Note: Clustered standard errors appear in parentheses. All cells report the coefficient for Microbe Literacy $\cdot$ TBI_H. Row 1 reproduces the estimates in Table 8. Rows $2-4$ use three alternative TBI definitions and Rows $5-8$ control for the interaction of treatment with baseline covariates, as we describe in the text. We adjust significance levels for multiple hypothesis testing across outcomes. † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

References

Aiello, Allison, Rebecca Coulborn, Vanessa Perez, and Elaine Larson, "Effect of Hand Hygiene on Infectious Disease Risk in the Community Setting: a Meta-Analysis," *American Journal of Public Health*, August 2008, *98* (8), 1372–1381.

Fewtrell, L, RB Kaufmann, D Kay, W Enanoria, L Haller, and JM Colford, "Water, Sanitation, and Hygiene Interventions to Reduce Diarrhoea in Less Developed Countries: a Systematic Review and Meta-Analysis," *Lancet Infectious Diseases*, 2005, *5* (1), 42–52.

Fox, John, *Applied Regression Analysis and Generalized Linear Models, Third Edition*, SAGE Publications, 2015.

Meghir, Costas and Steven Rivkin, "Econometric Methods for Research in Education," in Eric Hanushek, Stephen Machin, and Ludger Woessmann, eds., *Handbook of the Economics of Education, Volume 3*, North Holland, 2011.

Ram, Pavani, "Practical Guidance for Measuring Handwashing Behavior," March 2010. Water and Sanitation Program Working Paper.

___ **, Iqbal Jahid, Amal Halder, Benjamin Nygren, M. Sirajul Islam, Stewart Granger, John Molyneaux, and Stephen Luby**, "Variability in Hand Contamination Based on Serial Measurements: Implications for Assessment of Hand-Cleansing Behavior and Disease Risk," *American Journal of Tropical Medicine and Hygiene*, April 2011, *84* (4), 510–516.

Rivkin, Steven, Eric Hanushek, and John Kain, "Teachers, Schools, and Academic Achievement," *Econometrica*, March 2005, *73* (2), 417–458.