Design, Implementation and Evaluation of a Handwashing Campaign in Harare, Zimbabwe

A case study applying the practical guide *Systematic Behavior Change in Water Sanitation and Hygiene*

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Table of contents

Overview

Consistent hand hygiene can reduce morbidity and mortality from diarrheal and respiratory diseases. Diarrhea and pneumonia are still the leading causes of mortality among children under five years of age in low-income and middle-income countries. Recent findings suggest that interventions promoting handwashing with soap lead to a 40% reduction in the risk of diarrhea. Despite its health impact, handwashing with soap is seldom practiced. It is estimated that less than 20% of people worldwide wash hands with soap after contact with feces, with a mean prevalence of 13% to 17% in low- and middle-income regions. Considering these low handwashing rates, interventions promoting handwashing behavior are of paramount importance.

The objectives of our project were to promote handwashing with soap at critical times among school children, caregivers, and policy makers in Harare, Zimbabwe and to disseminate the results among international actors in the water, sanitation, and hygiene (WaSH) sector.

The handwashing campaign is part of the second phase of the Handwashing in India and Africa project initiated and funded by the Swiss Agency for Development and Cooperation (SDC). High-density suburbs of Harare, Zimbabwe and the province of Ngozi in rural Burundi were chosen as pilot areas for the handwashing campaigns. While the political situation in Burundi did not allow the project to be completed there, the part in Zimbabwe was largely implemented as planned and is the subject of this case study.

The campaign was designed by Eawag in collaboration with the Università della Svizzera Italiana and WASH United. The data collection was implemented by Eawag in collaboration with the University of Zimbabwe. The campaign was implemented by ActionAid Zimbabwe and in collaboration with the Ministry of Health and Child Welfare of the Government of Zimbabwe and Eawag.

This case study aims at illustrating how *Systematic Behavior Change in Water, Sanitation and Hygiene. A practical guide using the RANAS approach* by Hans-Joachim Mosler and Nadja Contzen[1] (referred to in this case study as *Systematic Behavior Change*) was applied in a real project. The structure of this case study follows the steps of *Systematic Behavior Change* exactly: It presents how we put each *phase*, *step*, and *key action* described in *Systematic Behavior Change* into practice during our handwashing campaign in Zimbabwe and what the results were. Our aims are to bridge the gap between the steps described in *Systematic Behavior Change* and their application in the field and to inspire practitioners to follow our example.

[1] Mosler, H.-J., & Contzen, N. (2016). Systematic behavior change in water, sanitation and hygiene. A practical guide using the RANAS approach. Version 1.1. Dübendorf, Switzerland: Eawag

Phase 1: Identify potential psychosocial and contextual factors

Step 1.1: Define the behavior to be changed and the specific population group to be targeted

Key actions

Define the target behavior

The high-density suburbs of Harare suffer from frequent cyclic outbreaks of diarrheal disease. Since open defecation is rarely practiced, inadequate hand hygiene and consumption of unsafe drinking water are the two most likely causes of these outbreaks. Whereas numerous projects have focused on provision of safe drinking water, the current project was focused on handwashing promotion.

Preconditions for handwashing with soap comprise the availability of a place and device for handwashing and the presence of soap. Consequently, making water and soap readily available for handwashing are considered preparatory behaviors.

We preliminarily defined washing hands with soap and effective technique, including adequate hand drying, in key handwashing situations as the main target behavior. We defined key handwashing situations as:

- After using the toilet
- After other contact with feces, e.g. changing diapers, cleaning toilet
- Before preparing food
- Before eating.

Adequate handwashing technique was preliminarily defined as:

- Rinsing hands using a tap or pouring water from a jug
- Applying soap
- Scrubbing the palms, backs and finger tips of both hands, scrubbing between the fingers and scrubbing under finger nails
- Rinsing hands using a tap or pouring water from a jug
- Drying hands using a clean towel or air drying.

We aimed to assess the actual handwashing practices in the field and find out whether there was a real need for improvement through a qualitative pre-study in potential intervention areas. We visited approximately 20 households, interviewed participants about when and how they washed hands, observed their manner of handwashing, and inspected the local handwashing facilities. Handwashing with water only was common in the potential study areas, whereas handwashing with soap was rarely practiced. Besides, the way in which respondents reported and showed washing their hands varied considerably between respondents. In summary, there was potential for improvement regarding both frequency and technique of handwashing.

In addition, we assessed the potential for a handwashing campaign in schools. Since the permits to work in primary schools were still pending, we were not able to visit primary schools and had to base our pre-study on expert interviews. We interviewed representatives of the Ministry of Primary and Secondary Education and of NGOs that had worked on handwashing promotion. According to the responses of the experts, washing hands with water only at sinks was common in schools where the necessary infrastructure and water supply were present. The prevalence of washing hands with soap and water was reported to be low. Furthermore, interviews indicated that few activities had been implemented to promote handwashing in schools. Taken together, the potential for improvement of handwashing practices was likely to exist both in schools and the wider community.

Select the target population group

Effective hand hygiene should be practiced by everyone. We identified primary caregivers, the persons taking care of children and household work, as the individuals whose handwashing behavior probably has the highest influence on the family's health. Consequently, the campaign activities to be implemented in the community focused on primary caregivers as the primary target group. The campaign activities to be implemented in schools focused

on primary school children as the primary target group. We defined remaining household members as a secondary target group to be included in campaign activities whenever possible. The household visits during the pre-study indicated that primary caregivers were, as expected, mostly female. In numerous households, at least one person was working away from the house. Consequently, reaching the working household members as part of the secondary target group was challenging.

Since changing the behavior of children was expected to require different behavior change strategies than changing adults' behavior, we decided to design strategies specifically for children and other strategies specifically for adults. The design, implementation, and evaluation of both the strategies for caregivers and the strategies for children are presented in this case study.

We focus here on the strategies designed to increase handwashing frequency in key situations. To keep this case study as concise as possible, we do not report the strategies implemented to improve handwashing technique.

Step 1.2: Collect information on psychosocial and contextual factors that might influence the target behavior

Key actions

Conduct short qualitative surveys and spot-check observations

Individual qualitative interviews were conducted with approximately 20 caregivers in several high-density suburbs of Harare. Besides assessing the target behavior, the main goals of these interviews were to find out about the water infrastructure available, the health situation, and potential behavioral factors affecting handwashing with soap. In addition, we wanted to find out what kind of handwashing campaigns had already been implemented in the target areas. Since primary caregivers had been specified as the primary target population, most but not all interviews were conducted with primary caregivers.

The following questions were used to guide the qualitative interviews:

- How common are diarrhea and other water-borne diseases?
- What are the main sources of drinking and domestic water?
- Are there seasonal changes in the hygiene situation?
- What are major health concerns of the respondents?
- How readily available is water?
- How readily available is soap?
- What are the local handwashing facilities?
- What are reasons for washing or not washing hands with soap?
- Which promotion activities for handwashing have been implemented?
- By whom, when, and where were they implemented?

Since we were unable to enter primary schools during the pre-study, qualitative information on factors that potentially influenced handwashing in school was based on expert interviews and interviews with children when they were at home.

Analyze the surveys

The interviews confirmed that diarrhea was common and that periodic epidemics of typhoid occurred in several potential study areas. Diarrhea was reported to occur throughout the year, with peaks during the rainy seasons. Water availability depended strongly on the area; in some areas, running water from a tap was readily available, while in others, taps had been dry for weeks, and respondents had to rely on public wells. Preventing the spread of HIV and cholera epidemics, such as occurred in 2008, were among the most frequently mentioned health concerns.

All households had water taps; however, these were dry in about half of the households visited. In addition to washing hands in a sink, hands were frequently washed by pouring water from a jug or dipping them into a vessel containing water. Soap was available in all households and commonly used for laundry, dishes, washing the body, and sometimes handwashing.

The most commonly stated reason for washing hands with soap was to prevent water-borne diseases. The most common reasons people gave for not washing hands with soap was that they were not convinced of the benefits of using soap, forgot to wash hands in key handwashing situations, or decided not to wash their hands when in a hurry. Frequent and long-lasting water cuts were probably another hindrance to handwashing. Participants used tap, well, or borehole water for handwashing.

There had been previous handwashing campaigns implemented by local community health promoters. However, few respondents remembered the exact content of the activities. During the cholera epidemic in 2008, numerous activities to promote handwashing had been implemented, and handwashing devices (in the form of buckets with a tap) and soap had been distributed.

With regard to handwashing in schools, the interviews with experts and children yielded that most schools in suburbs of Harare had sanitation and handwashing facilities. Providing these facilities was a requirement of government regulations. The functionality of the facilities was, however, questionable. Some schools provided soap to students; however, few provided soap in sufficient quantities.

Children stated that they washed their hands to follow the instructions of teachers and caregivers and out of fear of diarrheal diseases and cholera. When asked about the reasons for not washing hands, children mentioned the lack of water and soap, forgetting to wash hands, being in a hurry, and considering handwashing boring. In addition, the interviewed experts assumed that children did not know why handwashing was important.

Step 1.3: Allocate psychosocial and contextual factors to the RANAS mode

Key actions

To allocate the potential psychosocial and contextual factors to the RANAS factors

We considered all the original RANAS factors as psychosocial factors potentially steering handwashing behavior in primary caregivers. In addition, we examined the findings from the qualitative interviews to identify additional factors which are not part of the RANAS model but which may be relevant to our study community. The most frequently stated reason for washing hands with soap was to prevent diarrhea. This was allocated to the factor *Vulnerability* in the risk factor block. The statement that participants did not wash hands with soap because they did not see the benefits of doing so was allocated to *Beliefs about costs and benefits* under attitude factors. Deciding not to wash hands with soap in key situations, particularly when in a hurry, was also given as a reason for not washing hands. Since such barriers did not fit the RANAS factors, we decided to treat them as additional factors.

Among contextual factors, we identified the availability of soap, water, and a handwashing device that allows unassisted handwashing as potentially relevant behavioral factors.

With the primary school children, we decided to exclude some of the original RANAS factors from the data collection. *Confidence in recovery* turned out to be a construct that was extremely difficult to explain to children. Also, *Action planning* and *Barrier planning* were not further considered. The idea of planning was difficult to explain, and based on child development theory, we considered it unlikely that such specific and conscious planning would be a factor relevant to the behavior of primary school children.

The availability of soap and water at handwashing devices suitable for children were hypothesized to be major constraints of handwashing behavior. Both experts and children had mentioned a lack of soap and water and dry or broken taps in toilet buildings.

Phase 2: Measure the psychosocial factors and determine those steering the target behavior

Step 2.1: Develop a questionnaire to measure behavioral factors and the behavior and a protocol to conduct observations of the behavior

Key actions

Develop a questionnaire

As decided during Phase 1, our project aimed to raise the frequency of handwashing with soap at key handwashing times among primary caregivers and children. Consequently, we designed our questionnaire to obtain self-reported frequencies of handwashing with soap and the corresponding behavioral factors. To measure the behavior of caregivers, we used the items in the following table.

Behavior
In the following situations, how often do you wash your hands with soap and water? Please tell us in how many out of 10 times you wash your hands with soap and water in the following situations… - *Before eating?* - *Before preparing/cutting food?* - *Female respondents with young children: before breastfeeding a child?* - *Respondents with young children: before feeding a child?* - *After urinating?* - *After defecating?* - *Respondents with young children: after cleaning a child's bottom?* - *After other contact with stool?*

Subsequently, psychosocial factors potentially steering caregivers' behavior were assessed.

Risk factors	
Health knowledge	We assessed *Health knowledge* using three items in the format of open questions with given responses (see Tool 2.1.1). Data collectors recorded which of the prespecified and correct answers the respondent mentioned. Health knowledge was computed as the number of correct answers given divided by the number of total prespecified and correct answers. The items were: What are the consequences of diarrhea? - *Loose, watery stool / frequent toilet use* - *Loss of water/ salt from the body,* - *Loss of weight/ underweight* - *Fever, weakness, body/ stomach ache* - *I don't know* - *None of the previous points mentioned* What are typical ways you can get diarrhea? - *Don't wash hands with soap before handling food* - *Don't wash hands with soap after contact with stool* - *Consume contaminated food (germs, rotten)* - *Consume contaminated drinking water* - *I don't know* - *None of the previous points mentioned* What can you do to not get diarrhea? - *Wash hands with soap before handling food* - *Wash hands with soap after contact with stool* - *Don't consume contaminated food/ Boil, wash, peel, cover food* - *Don't consume contaminated water/ Treat drinking water, consume only safe water* - *Use toilets / cover toilets*

	- *I don't know* - *None of the previous points mentioned*
Vulnerability	We assessed *Vulnerability* using four items, with two items each asking for vulnerability with regard to stool and food related handwashing. The items for stool-related handwashing were: If you **always** wash your hands with soap and water after contact with stool, how high do you feel is the risk that you contract diarrhea? If you **never** wash your hands with soap and water after contact with stool, how high do you feel is the risk that you contract diarrhea? *No risk at all / Little risk / Medium risk / High risk / Very high risk*
Severity	Imagine you contracted diarrhea, how severe would be the impact on your daily life? *Not severe at all / Little severe / Medium severe / Very severe / Extremely severe*

Attitude factors	
Beliefs about costs and benefits	We surveyed *Beliefs about costs and benefits* using four items, with two items each for food and stool-related handwashing. The items for stool-related handwashing were: How effortful do you think is always washing hands with soap and water after contact with stool? *Not effortful at all / A little effortful / Medium effortful / Very effortful / Extremely effortful* How certain are you that always washing hands with soap and water after contact with stool prevents you from getting diarrhea? *Not certain at all / A little certain / Medium certain / Very certain / Extremely certain*
Feelings	We assessed *Feelings* using four items, with two items each for food and stool-related handwashing. The items for stool-related handwashing were: How much do you like washing hands with soap and water before handling food? *I don't like at all / I like a little / I quite like / I like it a lot / I like very much* How disgusting do you think is it to not always wash hands with soap and water before handling food? *Not disgusting at all / A little disgusting / Medium disgusting / Very disgusting / Extremely disgusting*

Normative factors	
Others' behavior	We assessed *Others' behavior* using four items, with two items each for food and stool-related handwashing. The items for stool-related handwashing were: How many people in your **household** always wash hands with soap and water after contact with stool? *(Almost) nobody / Some of them / Half of them / Most of them / (Almost) all of them* How many people in your **community** always wash hands with soap and water after contact with stool? *(Almost) nobody / Some of them / Half of them / Most of them / (Almost) all of them*
Other's (dis)approval	We assessed *Other's (dis)approval* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: People who are important to you, how much do they think you should always wash your hands with soap and water after contact with stool? *Not at all / A little / Medium / A lot / Very much*

Ability factors	
How-to-do knowledge	We assessed *How-to-do knowledge* similarly to health knowledge using two items. How-to-do knowledge was computed as the number of correct given answers divided by the number of correct total answers. The items were: What are the different steps for good handwashing? - *Wet hands with water*

	- *Put soap* - *Rub hands (general)* - *Rub the palm of the hand* - *Rub between the fingers* - *Rub under the finger nails* - *Rub the finger tips* - *Rub the back of the hands* - *Rub for at least 20 seconds* - *Rinse hands with water* - *Dry hands with a clean towel / air dry hands* - *I don't know* In which situations is it critical to wash hands with soap? - *After defecating* - *After cleaning a child's bottom* - *After other contact with stool* - *Before breastfeeding a child* - *Before feeding a child* - *Before preparing food* - *Before handling drinking water* - *Before eating* - *I don't know*
Confidence in performance	We assessed *Confidence in performance* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: How confident are you that you can always wash your hands with soap and water after contact with stool? *Not at all confident / A little confident / Quite confident / Very confident / Extremely confident*
Confidence in continuation	We assessed *Confidence in continuation* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: How confident are you that you can always wash hands with soap and water after contact with stool, even if circumstances are difficult? *Not at all confident / A little confident / Quite confident / Very confident / Extremely confident*
Confidence in recovering	We assessed *Confidence in recovery* using one item: Imagine you have stopped always washing hands with soap and water before handling food and after contact with stool for several days, for example because there was no water or soap for handwashing. How confident are you that you will start washing hands again? *Not at all confident / A little confident / Quite confident / Very confident / Extremely confident*

Self-regulation factors	
Action planning	We assessed *Action planning* using six items, with three items each for food and stool-related handwashing. The items for stool-related handwashing were: Do you have a plan which device you use to dispense water for washing hands after contact with stool? *Yes / No* Do you have a plan to always wash your hands with soap and water after contact with stool at a specific location? *Yes / No* Do you have a plan where you keep the soap for handwashing after contact with stool? *Yes / No*
Action control	We assessed *Action control* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: How aware are you of your goal to wash hands with soap and water after contact with stool? *Not aware at all / A little aware / Quite aware / Very aware / Extremely aware*
Barrier planning	We measured *Barrier planning* using three items with open response format without given responses. The three items were: Do you have a plan how to avoid forgetting to always wash hands with soap and water before handling food, and after contact with stool? Do you have a plan how you can wash your hands with soap and water before handling food and after contact with stool, even if you are in a hurry? Do you have a plan how you can wash your hands with soap and

	water before handling food and after contact with stool, even if there is no soap at home?
Remembering	We assessed *Remembering* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: When you think about the last 24 hours, how often did it happen that you intended to wash hands with soap and water after contact with stool and then forgot to do so? These items investigated a frequency. The same answer format, ranging from "0 out of 10 times" to "10 out of 10 times", as for behavior was used.
Commitment	We assessed *Commitment* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: How committed are you to always washing your hands with soap and water after contact with stool? *Not committed at all / A little committed / Quite committed / Very committed / Extremely committed*

Additional items	
Hindrance	Lack of soap and water as hindrances of handwashing were assessed with two items: How often does it happen that you want to wash your hands with soap and water before handling food or after contact with stool, but there is no water at home? How often does it happen that you want to wash your hands with soap and water before handling food or after contact with stool, but there is no soap at home? Whether being in a hurry or not feeling like washing hands prevented participants from handwashing was assessed using four items with two items each for food and stool-related handwashing. The items for stool-related handwashing were: After contact with stool: How often does it happen that you do not wash your hands with soap and water because you don't feel like doing it? After contact with stool: How often does it happen that you do not wash your hands with soap and water because you are in a hurry? These items investigated a frequency. The same answer format, ranging from "0 out of 10 times" to "10 out of 10 times", as for behavior was used.

Develop an observation protocol

Self-reported data are subject to biases. Consequently, handwashing behavior was also surveyed through 3-hour structured observations. The observation protocol was as follows:

Observations
What key situation happens? *Household member uses toilet / Household member changes diaper / Household member has other contact with stool / Household member eats / Household member drinks / Household member prepares food (direct food contact) / Household member prepares food (no direct food contact)*
Which household member was it? *Primary caregiver / Index child / …*
For food-related handwashing situations: Immediately before contact with food, did the person wash hands? *Yes / No / Could not see*
For stool-related handwashing situations: Immediately after contact with stool, did the person wash hands? *Yes / No / Could not see*
If hands were washed, how did the person wash hands? *Rinsed only the right hand with water / Rinsed only the left hand with water / Rinsed both hands with water / Washed only the right hand with soap / Washed only / the left hand with soap / Washed both hands with soap / Washed both hands with soapy water / Took a bath / I am not sure / could not see*

In addition to the direct observations of behavior, we performed spot checks to survey the presence of soap and water. First, this served as a proxy measure for handwashing behavior. Second, we wanted to find out how readily

available the handwashing infrastructure was in the target households. The spot-check protocol was as follows.

Spot checks
Ask: Does this household have a water tap? *Yes / No*
Is there water? *Yes / No*
Ask: Is there a specific place for handwashing before handling food? *Yes / No*
Where is the place for handwashing before handling food? *Inside the house / Outside the house*
What kind of handwashing facility is it? *Tap from running water / Tap from reservoir / Bowl to dip hands / Small vessel, e.g. bowl, jug to pour water on hands / Jerry can / Other*
Is it accessible from the house without walking in the rain? *Yes / No*
Is there water? *Yes / No*
Is there soap? *Yes / No*
If yes, what kind of soap is there? *Yes / No*
Ask: Is there a specific place for handwashing after contact with stool? *Yes / No*
… Same items as for food-related handwashing facility.

To measure the handwashing behavior of children, we used the following items.

Behavior
Do you wash your hands with soap and water before eating at school?
Do you wash your hands with soap and water after using the toilet at school?
Not at all / a little / a medium amount / a great deal

Subsequently, psychological factors potentially steering children's' behavior at school were assessed. The response categories of all closed questions were the same. Only four response categories were used, and they read as follows:

Not at all / a little / a medium amount / a great deal

To assist children in choosing the appropriate answers, we wrote them on cards, which were placed in front of the children during the interview. Children could answer questions either by speaking their response or by pointing to the appropriate card.

Risk factors	
Health knowledge	We assessed *Health knowledge* using three items in the format of open questions with given responses (see Tool 2.1.1 of *Systematic Behavior Change*). Interviewers recorded which of the pre-specified and correct answers the child mentioned. Health knowledge was computed as the number of correct given answers divided by the number of total pre-specified and correct answers. The items were: What are the consequences of diarrhea? - *Loose, watery stool / frequent toilet use* - *Loss of water/ salt from the body,* - *Loss of weight/ underweight* - *Fever, weakness, body/ stomach ache* - *I don't know* - *None of the previous points mentioned* Can you tell me why people get diarrhea? - *Don't wash hands with soap before handling food* - *Don't wash hands with soap after contact with stool* - *Consume contaminated food (germs, rotten)* - *Consume contaminated drinking water* - *I don't know* - *None of the previous points mentioned*

	How can you protect yourself against diarrhea? - *Wash hands with soap before handling food* - *Wash hands with soap after contact with stool* - *Don't consume contaminated food/ Boil, wash, peel, cover food* - *Don't consume contaminated water/ Treat drinking water, consume only safe water* - *Use toilets / cover toilets* - *I don't know* - *None of the previous points mentioned*
Vulnerability	Do you feel you can get diarrhea often?
Severity	Is it bad for you if you get diarrhea?

Attitude factors	
Beliefs about costs and benefits	Do you have a better health if you wash your hands before eating? Do you have a better health if you wash your hands after toilet use? Does washing hands with soap and water take a lot of time? Is it hard for you to wash your hands with soap and water before eating at school? Is it hard for you to wash your hands with soap and water after toilet use at school?
Feelings	Do you like to wash your hands with soap and water? Do you feel dirty if you don't wash your hands before eating? Do you feel dirty if you don't wash your hands after using the toilet?

Normative factors	
Others' behavior	We assessed *Others' behavior* using four items, with two items each for food and stool-related handwashing. The items for stool-related handwashing were: Do other children at school wash hands with soap and water after toilet use? Do your family members wash hands with soap and water after toilet use?
Other's (dis)approval	We assessed *Others' (dis)approval* using four items, with two items each for food and stool-related handwashing. The items for stool-related handwashing were: Do your teachers think you have to wash your hands with soap and water after toilet use? Do people who look after you think you have to wash your hands with soap and water after toilet use?

Ability factors	
How-to-do knowledge	What do you need to wash your hands? *Wet hands with water* - *Water* - *Soap* - *Ash* - *Mud* - *I don't know* In which situations is it critical to wash hands with soap? - *After defecating* - *After cleaning up a child's bottom* - *After other contact with stool* - *Before breastfeeding a child* - *Before feeding a child* - *Before preparing food* - *Before handling drinking water* - *Before eating* - *I don't know*
Confidence in performance	We assessed *Confidence in performance* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: Are you sure that you can always wash your hands with soap and water after toilet use at school?

Confidence in continuation	Imagine you are very hungry. It is lunchtime or break at school. Your schoolmates are already eating. Are you sure, that in this situation, you will wash your hands with soap and water before eating? Imagine you need to go to the toilet at school, but your friends are waiting for you. They will not wait long. You are in a hurry! Are you sure that, in this situation, you will wash your hands with soap and water after toilet use?

Self-regulation factors	
Action control	We assessed *Action control* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: Do you pay attention to always wash your hands with soap and water after toilet use?
Remembering	We assessed *Remembering* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: Do you always remember to wash your hands with soap and water after toilet use?
Commitment	We assessed *Commitment* using two items, with one item each for food and stool-related handwashing. The item for stool-related handwashing was: Is it important to you to wash your hands with soap and water before eating?

Develop an observation protocol

In addition to the self-reported measures, handwashing was also observed for two consecutive days in each school. It was not possible to perform individual observations with children; these would have allowed us to track children during their day at school and record the key handwashing situations in which they washed their hands. Further, particular handwashing facilities for food-related handwashing were not present. Consequently, it was not possible to determine whether children washed hands before eating during the lunch breaks, and behavioral observations were only conducted for stool-related handwashing.

Observations
Did the child wash hands when leaving the toilet building? *Yes / No / Could not see*
If yes, how? *Rinsed hands with water / Washed hands with soap and water/ Rinsed hands with soapy water / Could not see*

Similar to the household survey, we performed spot checks to survey the presence of handwashing facilities, soap and water. Spot checks were conducted before the breaks, when the majority of key handwashing events occurred.

Spot checks
Is there a specific facility for handwashing **after contact with stool**? *Yes / No*
How many facilities for handwashing after contact with stool are there? *(Open question)*
Where are the handwashing facilities located? *Outside, on the compound of the school / Inside the building / Inside the toilet/ latrine building*
What kind of handwashing facilities are there? *Running water from a tap / Water containers with a valve and a collection vessel / Vessels to pour water and vessels to collect water / Vessels to pour water without vessels to collect water / Bowls or basins to dip hands / Other*
Is there soap? *Yes, in all cases / Yes, in most cases / Yes, in half of the cases / Yes, in some cases / No, in none of the cases*
Is there water? *Yes, in all cases / Yes, in most cases / Yes, in half of the cases / Yes, in some cases /*

No, in none of the cases
Are there handwashing facilities inside or just outside the classrooms? *Yes, in all cases / Yes, in most cases / Yes, in half of the cases / Yes, in some cases / No, in none of the cases*
What kind of handwashing facilities are there? *Running water from a tap / Water containers with a valve and a collection vessel / Vessels to pour water and vessels to collect water / Vessels to pour water without vessels to collect water / Bowls or basins to dip hands / Other*
Is there soap? *Yes, in all cases / Yes, in most cases / Yes, in half of the cases / Yes, in some cases / No, in none of the cases*
Is there water? *Yes, in all cases / Yes, in most cases / Yes, in half of the cases / Yes, in some cases / No, in none of the cases*

Step 2.2 Conduct a baseline survey

Key actions

Translate the questionnaire into the local language

The questionnaires were translated from English into the local language, Shona, by the field supervisors of the project. The field supervisors had been working for the project since the beginning of the pre-study and were thus familiar with both the RANAS approach and the study communities. The questionnaires were then re-translated into English by a member of the data collection team. We next compared the original and the retranslated English versions of the questionnaires to identify translation mistakes and revised the Shona questionnaires.

Define the sample size and the sample selection procedure

Since the target population comprised caregivers and children from across Harare, it was not possible to survey the entire population. Instead, we decided to sample a total of 600 pairs of caregivers and children from 20 areas, that is, 30 pairs per area. From each area, we included one primary school in our survey, referred to as the project school. The children-caregiver pairs were selected randomly. Since a household register, required for true random sampling, was not available, we decided to select the pairs through random route sampling of households. Starting from randomly selected crossroads within each area, data collectors were to select every third house along their way. We selected only households which, first, had at least one child attending the project school in the area and, second, did not have any child attending any other project school.

We decided to perform interviews and spot checks in all 600 households and the behavior observations in a subsample of 300 households, due to financial constraints. We further decided to perform interviews with all 600 primary school children. We preferred conducting the interviews at school, to avoid biases potentially arising when interviewing children at home. Behavioral observations and interviews were conducted in all 20 project schools.

Schedule the field phase, define the number of data collectors to be employed and supervisors to appoint

To calculate the number of data collectors required, we estimated the capacity of one household data collector per day as follows.

Task	Required time
Observation household 1	3:00 hours
Interview household 1	1:30 hours
Spot checks household 1	0:30 hour
Transfer to household 2 and break	1:00 hour
Interview household 2	1:30 hours
Spot checks household 2	0:30 hour
Team transfer to area to be surveyed next day	1:00 hours
Consenting of households to be surveyed next day	1:00 hour
Total	**10:00 hours**

In order to sample the 30 households from one area in one day, we decided to work with a team of 15 household data collectors and train one additional data collector as stand-in. The timings above turned out to be a considerable underestimation. On most survey days, at least one data collector could not finish on time, and the entire team had to wait for that data collector before transferring to areas to be surveyed the next day for consenting. In addition, consenting turned out to be more time-consuming, due to caregivers being unavailable or unwilling to participate in the baseline survey.

We estimated the capacity of one school data collector as follows.

Task	Required time
Interviews with 5 children	2:30 hours
Observations during breaks	1:00 hours
Spot checks	0:30 hour
Transfer	2:00 hours
Extra time	2:00 hours
Total	**9:00 hours**

The timings of interviews, spot checks, and observations depended on the timetables of the schools. In addition, finding children and bringing them to the place where we conducted the interviews required close collaboration with the school staff. Consequently, we had to schedule sufficient time for data collectors to identify or wait for the next child to be interviewed. We decided to work with a team of eight data collectors for the school survey. This would allow us to visit each school on two consecutive days with a team of four data collectors.

Employ data collectors

We recruited data collectors through online job advertisements. A shortlist of 30 candidates was interviewed, and 24 data collectors were hired. In addition to the criteria listed in Box 2.2.2 of *Systematic Behavior Change*, primary selection criteria were previous experience in data collection and a social science background.

Organize the data collection

As a first step in organizing the data collection, we started applying for permits from the Government of Zimbabwe and other authorities 6 months prior to its start. We hired two local commuter buses to transport the team to the survey areas. Since the survey took place in Harare itself, data collectors could stay at home overnight. We visited all 20 areas and schools prior to the actual survey, to identify the exact streets where data were to be collected and to seek consent from the project schools.

Train the data collectors

Separate training was conducted for the school and household data collectors. Data collectors were trained for 5 days with two additional days of pre-testing in the field. During the first four days, the team was introduced to the project, the tools for data collection were discussed, and interviewing techniques were rehearsed. Both the English and the Shona versions of the questionnaire were included in the training, and the data collectors provided most valuable feedback to finalize the translation. On the last day, data collectors rehearsed the questionnaire in pairs, one data collector playing the role of a respondent and vice versa. Every day of training concluded with short participant feedback. The overall schedule of the data collection training was as follows.

Day	Activities
1	- Introduction of the project - Introduction RANAS approach - Use of tablets for data collection
2	- Questionnaire: behavior, risk factors, attitude factors - Interviewing techniques - Question types
3	- Questionnaire: norm, ability and self-regulation factors - Household selection procedure
4	- Behavioral observations - Spot checks - Preparation for mock interviews
5	- Mock interviews - Briefing pre-test

Pretest of the survey instruments in the field

We pre-tested the household survey for two days in an area which was not one of the 20 areas to be surveyed during the actual data collection. On the first day of the pre-test with household data collectors, only the interview and spot checks were tested in the morning. In the afternoon, we returned to the training location to discuss the experience of the team. On the second day, the full survey protocol of observation, interview, and spot checks was tested.

Again, experiences were discussed with the team in the afternoon. We pre-tested the school survey for two days at a primary school in the same area where the household survey had been tested; we discussed the experience of the team and changes to the survey tools after each day of pre-testing.

Revise the survey instruments

We revised the survey instruments after the team discussions on each pre-test day. However, scheduling an additional day for revision would have been preferable.

Conduct the data collection

We started with household data collection and began school data collection after the first two weeks of household data collection. Regular data collection in both households and schools took 20 working days. Households and schools with missing interview data were revisited to complete the questionnaires.

In households, behavioral observations were conducted from 6 a.m. to 9 a.m. At this time, most household members were present, and both food and stool-related key handwashing situations were most likely to be observed. The observations were followed by the interview. After a general introduction to the project, data collectors read each question to the respondents. For closed questions, the response options were also read aloud, and the respondent then chose one of the pre-specified response categories. If the respondent did not provide a pre-specified answer, the data collector probed further to obtain the exact response. Responses were entered directly onto tablet computers using ODKCollect data collection software. Finally, the spot checks were conducted.

In schools, behavioral observations of stool-related handwashing were conducted during breaks and after school, when most children used the toilets. Food-related handwashing was not observed, because there were no facilities for food-related handwashing. Interviews were conducted during the lessons. In each school, we were given a room in which to perform the interviews. We identified the children that we wanted to interview based on the data we had collected from their caregivers during the household data collection. These data comprised:

- Name of the child
- Age
- Class
- Teacher’s name.

Spot checks were conducted on the first day of data collection before the morning breaks.

Each data collection team was accompanied by one supervisor, who was also responsible for organizing the logistics of the survey and transferring the data from the tablets. Every day, data were checked for completeness, and feedback was given to the data collection team.

Step 2.3 Determine the psychosocial factors that steer the target behavior

Key actions

Enter, clean, and process the data

The data were collected electronically using ODKCollect on tablet computers. Consequently, data were already in an electronic format and did not have to be entered from paper-based documents. Further, we did not have to check whether the response options in the data file were within the possible range of response options in the questionnaire, since ODKCollect would only allow entry of values within the correct range.

Missing data were identified each day after the data collection. We used the conditional formatting function in Microsoft Excel to mark all empty cells. This enabled us to identify missing data through visual screening.

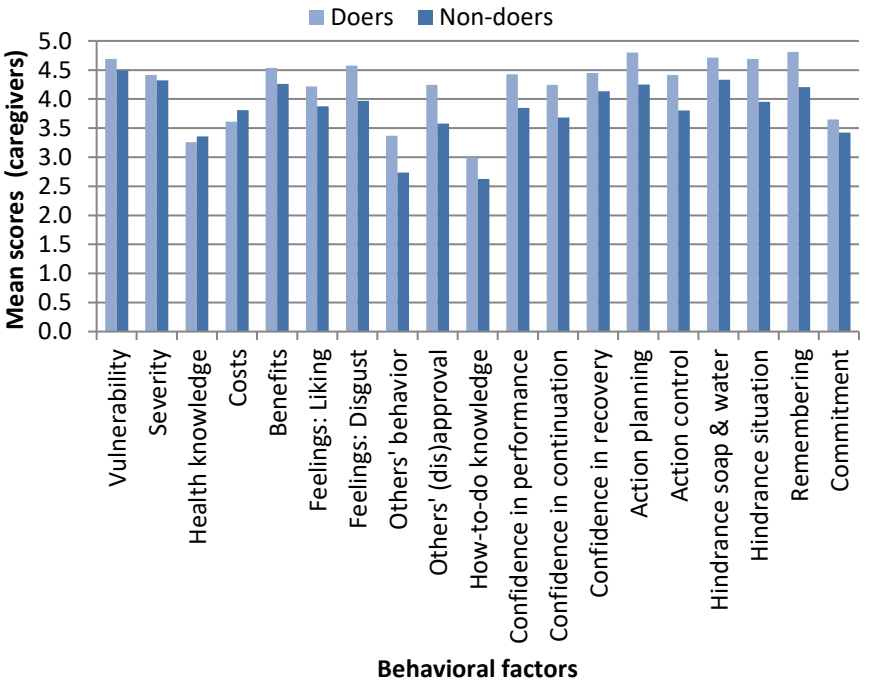
Some factors were measured through several items. In these cases, the mean of these items was computed for each participant to aggregate the individual items into one single value per factor.

Divide the sample into doers and non-doers of the target behavior

To divide the sample into doers and non-doers, we computed the mean self-reported handwashing frequency of each participant. This resulted in a measure ranging from 0 (For all key handwashing events, participant had reported never washing hands with soap) to 10 (For all key handwashing events, participant had reported washing hands in 10 out of 10 times). We defined caregivers as doers if their mean self-reported handwashing frequency was greater than or equal to 9 and as non-doers if this value was less than 9. This yielded 60 doers and 540 non-doers. We defined children as doers if their mean self-reported handwashing frequency was equal to 10 and as non-doers if this value was less than 10. This yielded 131 doers and 425 non-doers. The remaining 44 children were excluded from the analysis, because they were missing on the days of the survey or could not be located at the schools.

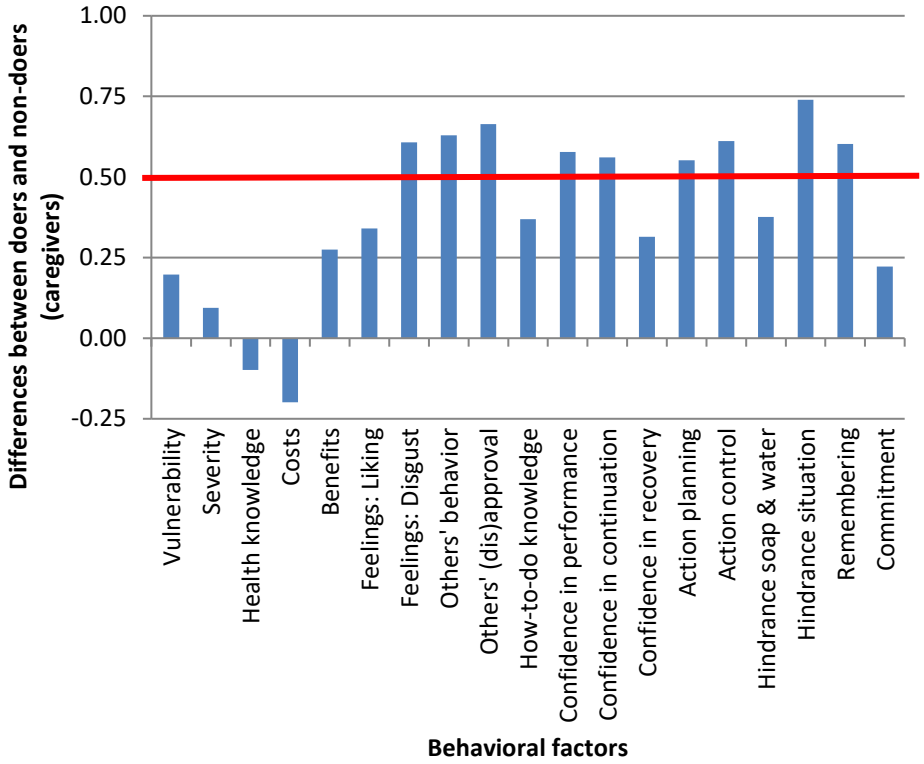
Calculate the mean scores of each psychosocial factor separately for doers and non-doers

The mean scores of doers and non-doers were calculated as explained in Example 2.3.3 of *Systematic Behavior Change*. Mean scores of behavior factors for caregivers are displayed below. Behavioral factors are aligned along the horizontal axis. For each behavioral factor, the mean score of the doers is presented as light blue bar, and directly next to it the mean score of the non-doers is displayed as a dark blue bar. The differences between doers and non-doers are indicated by different lengths of the bars and are further discussed in the next step.



Compare the mean scores between doers and non-doers to identify the behavior-steering factors

The differences between doers and non-doers are displayed for caregivers in the next graph. Again, behavioral factors are aligned along the horizontal axis. Here, the vertical axis displays the differences between doers and non-doers.



To identify the most relevant factors, we set a difference of 0.5 scale points as cut-off value. For caregivers, this yielded nine behavior factors that should be targeted by interventions:

- Feelings: Disgust
- Others' behavior
- Others' (dis)approval
- Confidence in performance
- Confidence in continuation
- Action planning
- Action control
- Hindrance situation
- Remembering.

Further, we measured *Barrier planning* using multiple-response questions. We determined the relevance of *Barrier planning* as a potential driver of handwashing behavior by selecting the response option most frequently mentioned by doers and the option most frequently mentioned by non-doers and comparing these two response options. For plans to avoid forgetting to wash hands with soap and water, 27% of doers reported keeping soap and water for handwashing near the place of defecation or food preparation, while 17% of non-doers reported doing so. For barrier plans on how to wash hands with soap even if the respondent was in a hurry, results were similar. For plans on how to cope with a lack of soap at home, 18% of doers and 15% of non-doers reported borrowing from neighbors. To summarize, there were only small differences between doers and non-doers in *Barrier planning*.

For children, the doer versus non-doer comparison yielded seven behavior factors to be targeted by the interventions (data not reported):

- Health knowledge
- Vulnerability
- Others' behavior
- Confidence in performance
- Confidence in continuation
- Action control
- Remembering.

In addition, the spot checks indicated that handwashing facilities in front of the toilet building were broken in most schools. Handwashing facilities in or in front of classrooms did not exist in any of the schools.

Phase 3: Select behavior change techniques (BCTs) and develop behavior change strategies

Step 3.1 Select BCTs to change the behavior-steering factors

Key actions

Select BCTs that correspond to the psychosocial factors according to the RANAS approach

For each behavior-steering factor, we selected the corresponding BCTs from the list (Tool 3.1.1 in *Systematic Behavior Change*). For the additional factor *Hindrance situation*, we selected the BCTs targeting barrier planning. For caregivers, the behavior-steering factors and corresponding BCTs from the RANAS approach are displayed in the table below. The BCTs that we selected for our campaign are formatted in bold.

Behavior-steering factor (caregivers)	Corresponding BCTs from the list
Disgust	**BCT 8 Describe feelings about performing and about consequences of the behavior**
Others' behavior	BCT 9 Inform about others' behavior
	BCT 10 Prompt public commitment
Others' (dis)approval	BCT 11 Inform about others' approval/disapproval
Confidence in performance	BCT 16 Provide infrastructure
	BCT 17 Demonstrate and model behavior
	BCT 18 Prompt guided practice
	BCT 19 Prompt behavioral practice
	BCT 20 Facilitate resources
	BCT 21 Organize social support
	BCT 22 Use arguments to bolster self-efficacy
	BCT 23 Set graded tasks/goals
Confidence in continuation	BCT 24 Reattribute past successes and failures
Action planning	**BCT 26 Prompt specific planning**
Action control	**BCT 27 Prompt self-monitoring of behavior**
	BCT 28 Provide feedback on performance
	BCT 29 Highlight discrepancy between set goal and actual behavior
Remembering	**BCT 34 Use memory aids and environmental prompts**
Hindrance situation (additional factor)	**BCT 30 Prompt coping with barriers**
	BCT 31 Restructure the social and physical environment
	BCT 32 Prompt to resist social pressure
	BCT 33 Provide negotiation skills

For the factors with only one corresponding BCT, we selected that BCT. However, for *Others' approval*, *Confidence in performance*, *Action control*, and *Hindrance situation*, the list yielded more than one matching BCT. We selected *BCT 10, Prompt public commitment,* to target *Others' behavior*. We considered *BCT 10* more powerful because it made participants actually witness others making a commitment to washing hands with soap and water at key times. In contrast, *BCT 9* would have meant merely telling participants that their peers already washed hands with soap at key handwashing times, although the survey had indicated that only very few participants actually did it.

To target *Confidence in performance*, we selected *BCT 18*, *Prompt guided practice*, and *BCT 21*, *Organize social support*, because we hypothesized that these BCTs would also target the most relevant norm factors: If guided practice was implemented in a community event, participants would see each other washing hands using soap *(Others' behavior)*. Social support at household level would also suggest that household members want each other to wash their hands with soap (*Others' (dis)approval*).

To target *Action control*, we decided to use *BCT 27*, *Prompt self-monitoring of behavior*. We preferred this to *BCT 28*, *Provide feedback on performance*, because providing feedback to each participating household would have involved many monitoring visits and was judged to be too time-consuming. We also preferred it to *BCT 29*, *Highlight discrepancy between set goal and actual behavior*, because we feared that *BCT 29* might have a negative impact on *Confidence in performance*.

To target *Others' (dis)approval*, we did not choose an additional BCT because we thought that *BCT 21*, *Organize social support*, already targeted *Others' (dis)approval*.

We interpreted the strong relevance of *Confidence in continuation* not to be a problem of lacking confidence *per se* but a result of actual barriers which prevented the participants from washing hands with soap and water. This was in line with the finding that the additional factor *Hindrance situation* was relevant for behavior. Consequently, we chose *BCT 30*, *Prompt coping with barriers*, to enable participants to overcome the hindrances and thus also to become more confident in continuing the behavior.

For the children, the BCTs that target the behavior-steering factors are displayed below. The BCTs that we selected for the campaign in schools are formatted in bold.

Behavior-steering factor (children)	Corresponding BCTs from the List
Health knowledge	**BCT 1 Present facts** **BCT 2 Present scenarios**
Vulnerability	**BCT 3 Inform about and assess personal risk**
Others' behavior	BCT 9 Inform about others' behavior **BCT 10 Prompt public commitment**
Others' (dis)approval	BCT 11 Inform about others' approval/disapproval
Confidence in performance	**BCT 16 Provide infrastructure** BCT 17 Demonstrate and model behavior BCT 18 Prompt guided practice BCT 19 Prompt behavioral practice BCT 20 Facilitate resources **BCT 21 Organize social support** BCT 22 Use arguments to bolster self-efficacy BCT 23 Set graded tasks/goals
Confidence in continuation	BCT 24 Reattribute past successes and failures
Action control	**BCT 27 Prompt self-monitoring of behavior** **BCT 28 Provide feedback on performance** BCT 29 Highlight discrepancy between set goal and actual behavior
Remembering	**BCT 34 Use memory aids and environmental prompts**

To target behavior-steering factors which have only one corresponding BCT (Tool 3.1.1 of *Systematic Behavior Change*), we selected that particular BCT. In cases where several BCTs target a behavior-steering factor, we had to make choices.

To target *Health knowledge*, we preferred *BCT 2*, *Present scenarios*, since we considered these more illustrative for children than merely presenting facts. However, *Presenting facts* (*BCT 1*) by using an F-diagram and showing the fecal-oral route of infection was already widely used to transfer *Health knowledge* in Harare. Consequently, we decided to use both *BCT 1* and *BCT 2*.

To target *Others' behavior*, we chose *BCT 10*, *Prompt public commitment*, for the same reasons as we chose *BCT 10* for the interventions targeting caregivers.

The school spot checks had shown that handwashing facilities in front of the toilet buildings were not working properly in most cases, and handwashing facilities in or in front of classrooms were not present at all. In this context, we interpreted the result that *Confidence in performance* and *Confidence in continuation* were important behavior-steering factors to be a consequence of lacking functional handwashing facilities. Consequently, we decided to focus on *BCT 16*, *Provide infrastructure*, to target *Confidence in performance* and decided not to employ BCTs which only manipulate the perceived ease of performing the behavior.

To support the maintenance of the handwashing facilities through students, we chose *BCT 21*, *Social support*. *BCT 21* focuses on how the students can organize themselves to make sure that soap and water are always available in classrooms and to create an enabling environment. During the stakeholder workshops, teachers had indicated that they were already overburdened with the daily school routine. Hence, it was crucial for the maintenance of handwashing facilities that student would take as much responsibility as possible.

To increase *Action control*, we chose *BCT 27*, *Prompt self-monitoring of behavior*, and *BCT 28*, *Provide feedback on performance*. We did not select *BCT 29*, *Highlight discrepancy between set goal and actual behavior*, because we feared that *BCT 29* could have a negative impact on *Confidence in performance*. We chose both *BCT 27* and *BCT 28*, because we intended to combine the two BCTs into one strategy in which children would monitor their behavior and teachers would give feedback. We hypothesized that feedback from teachers would, in addition, target *Others' (dis)approval*, because children would be made aware that their teacher wanted them to wash their hands with soap.

Step 3.2 Develop and design behavior change strategies

Key actions

Combine one or several BCTs with suitable communication channels to form a behavior change strategy AND Design behavior change strategies

Combining BCTs with suitable communication channels and designing the behavior change strategies was an iterative process. This was necessary because the selection of the communication channel strongly depended on the specific way in which the behavior change strategies should be implemented and vice versa.

For the campaign targeting caregivers, we had the opportunity to collaborate with health centers and community health promoters in our intervention areas. To make use of this opportunity, we decided to implement the BCTs through interpersonal communication, with community health promoters and health center staff acting as the promoters on the ground. For the campaign targeting children, we were able to work with primary school teachers as promoters. Consequently, interpersonal communication was also selected as the main communication channel for the school intervention.

We grouped BCTs into activities which should be implemented either at the beginning or at the end of the campaign. We further classified BCTs for caregivers on whether they were better delivered at the households (e.g. *Installation of prompts*) or better implemented in a community meeting (e.g. *Public commitment*). We decided to begin and end the campaign for caregivers with a community meeting so as to provide a formal kick-off and ending. The school campaign was implemented at classroom level. In addition, we decided to implement a school event to present and inaugurate the new infrastructure.

This resulted in grouping the strategies into four blocks each for the school and the community campaigns. Finally, we created one slogan for each intervention strategy in collaboration with social marketing experts. The intervention strategies, communication channels, slogans, BCTs, and RANAS factors targeted are displayed in the intervention matrices on the following two pages.

To organize soap supply to primary schools, the following strategies were considered.

Strategy	Reason for selection / not selection
Short term	
Schools purchase soap without external support	Schools face considerable financial challenges already
Income generating activities for schools to generate soap budget	School staff are already overburdened with ongoing routines
Voluntary donation from households (also soap rests)	Short term solution, might be difficult to maintain
Supply from project	**Not sustainable, only short term solution**
Long term	
Private-public partnership, soap donations from company	Only possible for a limited period of time
Soap production by school	School staff are already overburdened, safety concerns
School Development Council provides soap to schools	**Only possible for some schools, recommended by grassroots stakeholders**
Ministry of Primary and Secondary Education provides funds for soap	**Possible for all schools, difficult to initiate, limited resources at the Ministry**
Private-public partnership with Ministry, buy soap from company at a reduced rate in exchange for publicity in schools	Difficult to initiate, potentially sustainable

The strategies formatted in bold were selected. Soap supply accompanied the entire campaign implementation and continued for several months afterwards. At the time of writing, the implementing partner, School Development Council, and Ministry of Primary and Secondary Education were negotiating long-term soap supply to schools.

Strategy caregivers	Slogan	Communication channel	BCT	Activities	RANAS factor targeted
1	Handwashing? Of course! Because I like to be clean.	Interpersonal: Community meeting	BCT 8 Describe feelings about performing and about consequences of the behavior	Handwashing exercise visualizing dirt on hands to attach the feeling of disgust to not washing hands with soap and attach the feeling of cleanliness to washing hands with soap at key times.	Feelings: Disgust
			BCT 18 Prompt guided practice	Additional practice of handwashing with soap and effective scrubbing steps.	Confidence in performance
2	Handwashing? Of course! I can do it!	Interpersonal: Household visit	BCT 26 Prompt specific planning	Planning of when, where, and how to wash hands **before contact with food** and documentation of plans.	Action planning
			BCT 34 Use memory aids and environmental prompts	Plans are hung on the wall at the **place of food preparation** or eating.	Remembering
			BCT 27 Prompt self-monitoring of behavior	Distribution of a self-monitoring calendar, to record when hands were washed **before contact with food**. Placing self-monitoring calendar at handwashing location	Action control
3	Handwashing? Of course! We can do it!	Interpersonal: Household visit	BCT 26 Prompt specific planning	Planning of when, where, and how to wash hands **after contact with stool** and documentation of plans.	Action planning
			BCT 34 Use memory aids and environmental prompts	Plans are hung on the wall **in the toilet**	Remembering
			BCT 27 Prompt self-monitoring of behavior	Distribution of a self-monitoring calendar, to record when hands were washed **after contact with stool**. Placing self-monitoring calendar at handwashing location	Action control
			BCT 21 Organize social support	Initiate group discussion between household members how to support each other in washing hands with soap. Particular focus was put on how to cope with the barriers of not washing hands with soap when in a hurry or not feeling like washing hands at the right moment.	Confidence in performance + Others' (dis)approval
			BCT 30 Prompt coping with barriers		Hindrance situation + Confidence in continuation
4	Handwashing? Of course! We all do it!	Interpersonal: Community meeting	BCT 21 Organize social support	Volunteers perform small dramas in which they present their social support strategies to the other participants of the community meeting.	Confidence in performance + Others' (dis)approval
			BCT 10 Prompt public commitment	Participants commit in groups of ten in front of other community members to always washing their hands with soap at key times. Participants are rewarded with a certificate for participating and filling the self-monitoring calendar.	Descriptive norm

Strategy children	Slogan	Communication channel	BCT	Activities	RANAS factor targeted
1	Handwashing? Of course! It helps me stay healthy!	Interpersonal: Classroom activity	BCT 1 Present facts	The teacher asks the students what diarrhea is, how diarrhea is spread, and how it can be prevented. Discussion of fecal-oral route poster.	Health knowledge
			BCT 2 Present scenarios	Students reflect when the processes shown on the fecal-oral route poster happen during their daily life, draw one such situation and present it to the class.	
2	Handwashing? Of course! We have all we need!	Interpersonal: School event	BCT 16 Provide infrastructure	Repair existing handwashing stations at the toilets and provide handwashing stations for classrooms in form of one 20 l bucket with a tap fitted in it and a second 20 l bucket to hold the dirty water. Children build dispensers for soapy water from plastic bottles by piercing a hole in the cap of the bottles. Plastic bottles are decorated with paints provided by the project. Colorful soap dispensers and handwashing stations serve as reminders. At a school event, the handwashing stations are inaugurated and awards are given for the most creatively decorated soap dispensers.	Confidence in performance
			BCT 34 Use memory aids and environmental prompts		Remembering
		Interpersonal: Classroom activity	BCT 3 Inform about and assess personal risk	Handwashing exercise visualizing dirt on hands and explanation that not washing hands at key times increases diarrhea risk.	Vulnerability
3	Handwashing? Of course! We can do it!	Interpersonal: Classroom activity	BCT 21 Organize social support	In each class, two students are responsible for refilling the water buckets and soap dispensers.	Confidence in performance
			BCT 27 Prompt self-monitoring of behavior	Self-monitoring calendar, to record when hands are washed at key handwashing events. Calendars are hung up in classrooms.	Action control
			BCT 28 Provide feedback on performance	The teacher regularly checks the self-monitoring calendars and gives feedback to children.	Action control + Others' (dis)approval
4	Handwashing? Of course! Everybody!	Interpersonal: Classroom activity	BCT 21 Organize social support	Teachers and students revise the system of how handwashing stations are refilled. Students discuss how they can further support each other in washing hands with soap at key handwashing times.	Confidence in performance
			BCT 10 Prompt public commitment	Classes commit to washing hands with soap at key times through posters which they design. Posters are hung up on the inside and outside of the classroom doors, so students from the same and other classes can see them.	Descriptive norm

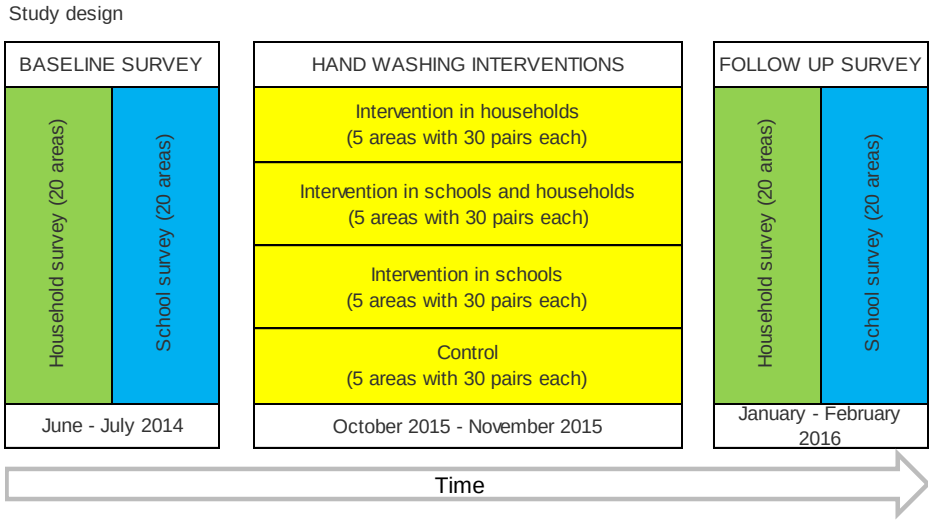
Phase 4: Implement and evaluate behavior change strategies

Step 4.1 Design an implementation protocol

Key actions

Assign the strategies to project communities or project groups

From the total of 20 project areas, each with 30 pairs of caregivers and children, we decided to test the combination of the community and school interventions in five areas and compare it to a control condition in another five areas. The remaining 10 areas were used to test the effects of the community and school intervention when each was implemented separately (results not presented here). When selecting the project areas at the beginning of the project, we had carefully selected spatially separated areas with as little interaction between each other as possible. This was necessary to avoid spillover between, for example, an intervention area and a neighboring control area. The trial design is shown in the chart below.



Since we had minimized spillover, we considered all areas to be independent and decided randomly whether an area was to receive the intervention or be part of the control. To do so, we wrote the area names in one Microsoft Excel sheet and, for each area, created a random number. We then sorted the sheet using the randomly assigned numbers and assigned the control condition to the first five areas and the intervention condition to the next five areas.

Step 4.2 Implement behavior change strategies

Key action

Plan the implementation of the strategies

Before planning the campaign in detail, we conducted stakeholder workshops to present the campaign proposal and to gather feedback. One workshop was conducted with health promoters and local health center staff; one workshop was conducted with councilors and members of the residence association; and another workshop was conducted with teachers, school heads, and representatives of the School Development Council. As a result, it was decided that the campaign for caregivers was going to be implemented by the health promoters and health center staff (referred to below as community promoters) and that the school campaign was going to be implemented by primary school teachers.

The implementation of strategies was primarily planned by the local implementing partner, ActionAid Zimbabwe, which also coordinated the campaign implementation and conducted the training with the community promoters and school teachers. Based on our initial campaign proposal, ActionAid Zimbabwe drafted intervention protocols that specified exactly how each strategy was going to be implemented, where, and by whom.

Train promoters in implementing the strategies

Promoters were trained by ActionAid Zimbabwe based on the intervention protocols. Separate training was conducted for the community promoters and for the school teachers. For each strategy, the training was conducted on the Saturday prior to the beginning of implementation. During the training, ActionAid Zimbabwe performed role-plays with the promoters in which the ActionAid trainers acted as promoters and the promoters as either household caregivers or school children. All campaign materials were distributed at the meetings. Each strategy was implemented in one or two weeks.

Since it was logistically not possible to train all the teachers of the project schools, only two volunteering teachers of each project school were trained by ActionAid. These two teachers then trained their colleagues in their school.

Monitoring the implementation

The campaign implementation was monitored by one of the supervisors who had worked for the project from the very beginning. The supervisor attended all the training sessions. To monitor whether the campaign was implemented as planned, selected community meetings, household visits, classroom activities, and school events were visited. In addition, feedback on the campaign implementation was gathered from community promoters and teachers at each training session.

In the campaign targeting caregivers, this indicated that the community meetings for Strategy 1 were attended by the majority of the study participants and additional community members. However, in most locations only four to five volunteers performed the handwashing exercise visualizing dirt instead of all the participants at the meeting. In many communities, the plenary discussion after the experiment focused on the risk of not washing hands with soap instead of focusing on disgust. For Strategies 2 and 3, monitoring visits and feedback from community promoters revealed that planning forms and self-monitoring calendars were not delivered as planned during the training. Instead, they were delivered during the subsequent weeks. Activities for Strategy 4 were largely implemented according to the intervention protocols. In contrast to the protocol, participants who had not submitted the self-monitoring calendar were not issued a certificate. As a reward for participation in the campaign, participants received lunch money. Monetary rewards had not been mentioned in either the campaign proposal or the intervention protocols.

In the campaign targeting children, the campaign monitoring indicated that material was often not distributed to the teachers during or shortly after the training but in most cases later in the week. Strategy 1 was, as a consequence, partly implemented without the posters of the fecal-oral route, and Strategy 3 was often implemented without the templates of the self-monitoring calendar. In most classes, the handwashing exercise visualizing

dirt was done by only one student instead of the entire class. Handwashing stations were delivered in sufficient quantities, with few exceptions.

The campaign implementation started in October 2015, 14 months after completing the baseline survey. The coordination with the local authorities during the campaign preparation, recruitment of the implementing partners, and development of the protocols and material had taken much longer than expected, which delayed the project considerably.

Step 4.3. Develop follow-up questionnaire and observation protocol and conduct survey

Key actions

Develop a follow-up questionnaire and observation protocol

We used the same questions, observations, and spot checks as in the baseline survey. In addition, we included questions and spot checks on which intervention strategies the participants had received. For each intervention strategy, we surveyed the participation of caregivers at three levels.

1. Whether the participant stated that she or he had participated in the strategy.
2. Whether the participant could name additional details, which she or he would only know from participating attentively.
3. Whether the participant could show material which had been distributed during the strategy.

For Strategy 4, the items were as follows.

Example items measuring campaign participation of caregivers
Do you remember the group meeting where community members received a certificate? - Yes - No
What activities do you remember? (Open question) - Drama performed by community members - Public pledge - Shouting the slogan “Handwashing? Of course! Everybody!” - None of the previous points mentioned
Did you receive a certificate during the campaign? - Yes - No
Can you show it to me? - Participant shows certificate - Participant does not show certificate

To measure the campaign participation of children, we used similar questions. However, the presence of campaign material was not surveyed individually for each child but for each classroom.

We used four items to measure how the participant perceived the campaign, two items each for group meetings and household visits. The items for the group meetings were as follows.

Example items measuring campaign perception of caregivers
How did you like the group meetings? - Did not like at all - Liked a little - Quite liked - Liked a lot - Liked very much
How convincing did you find the group meetings? - Not convincing at all - A little convincing - Quite convincing - Very convincing - Extremely convincing

Conduct follow-up survey

Since coordination with the local authorities, recruitment of the implementing partner, and campaign preparation had taken longer than expected, our project was far behind schedule when the campaign was implemented. Consequently, we decided to start the evaluation survey just six weeks after the end of the interventions. This means that the campaign evaluation

presented in this chapter is limited to short-term effects. Measuring long-term effects 6 or 12 months after campaign implementation would be necessary to determine whether the campaign achieved sustainable behavior change. However, the procedure described in this chapter can be applied to any evaluation irrespective of timing.

We wanted to conduct the follow-up survey with exactly the same participants that we had surveyed during the baseline. To track caregivers, we had recorded their names, names of heads of households, addresses, and mobile phone numbers. The supervisors of the survey called all households two weeks before the start of the data collection to update the address and, if possible, confirm availability during the survey period. Data collectors visited the households one day prior to the scheduled survey date to make an appointment for the next day. In many cases, respondents were not available on the scheduled day, and many revisits were necessary to collect data from as many respondents as possible. We found 422 of the initial 600 participants.

To track children, we had recorded their names, ages, and expected grades at the time of follow-up. We first called and then visited each school prior to the dates of data collection to schedule the data collection without interfering with other school activities. On these prior visits, we distributed the lists of all children to be interviewed to the school staff. In most schools, school staff assisted greatly in locating the children for interviews. However, a substantial number of children had transferred to other primary schools or dropped out. In addition, students who had been in Grade 6 at baseline had already transferred to secondary schools. Consequently, we only found 285 of the original 600 children.

Step 4.4 Estimate efficacy of the behavior change strategies

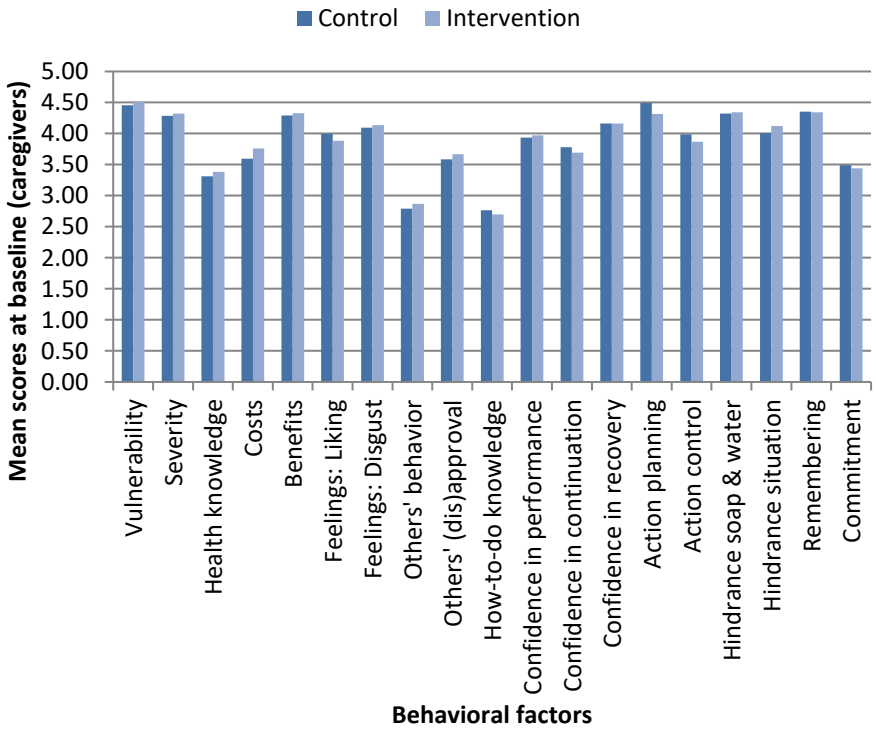
Key actions

Enter, clean and process the data

The follow-up data were cleaned and processed in exactly the same way as the baseline data.

Calculate mean scores at baseline and at follow-up separately for the control and the intervention group(s)

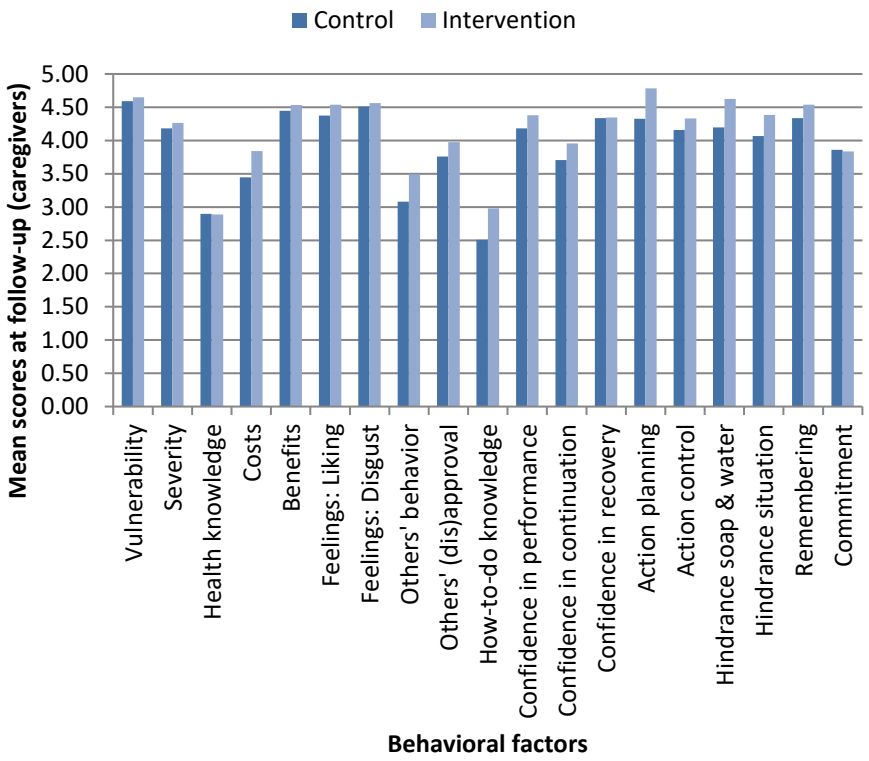
The mean scores of psychosocial factors of caregivers for the control and intervention groups **at baseline** are displayed below.



The fact that there were only marginal differences at baseline shows that both groups had similar starting conditions before the intervention. The share of self-reported doers was also quite similar in the control (12%) and intervention groups (7%). For observed behavior, handwashing rates were at 1% in the control group and at 3% in the intervention group at baseline.

With the children, baseline values of behavior and behavioral factors did not differ between control and intervention groups either. Observed handwashing with soap after using the toilet amounted to 4% in intervention schools and 1% in control schools. Observed food-related handwashing, measured as handwashing with soap before going to lunch, was 0% in both control and intervention schools, because handwashing facilities were not present. Differences with regard to behavioral factors were minimal.

The mean scores for behavioral factors of caregivers for the control and intervention group **at follow-up** are displayed in the next graph.

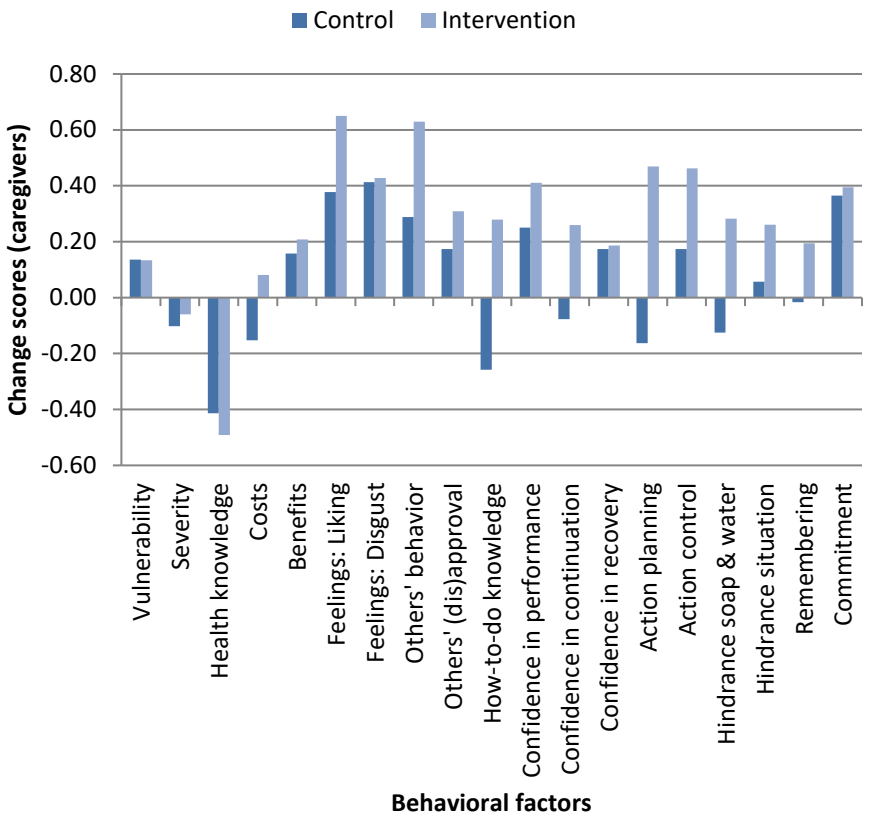


We can now see that, at follow-up, some behavioral factors differed between control and intervention groups. This is a first indication that our intervention affected the mindsets of the participants, which we discuss further below. For self-reported handwashing behavior, 24% of caregivers were classified as doers in the control group, while there were 34% doers in the intervention group. In the control group, we observed handwashing rates of 5% at follow-up, and in the intervention group, we observed 28% handwashing with soap at follow-up.

Stool-related handwashing among children remained as low as at baseline in both control and intervention schools. Spot checks revealed that handwashing facilities for stool-related handwashing did not work in either control or intervention schools. The failure of the campaign to increase stool-related handwashing thus could be attributed to the fact that handwashing facilities for stool-related handwashing had not been repaired as planned. In contrast, handwashing facilities for food-related handwashing were present in 74% of classrooms in intervention schools and not present in any control school. In 62% of classrooms in intervention schools, handwashing stations contained water, and in 55% of classrooms, soap was present. In classrooms where soap and water were present, the frequency of handwashing with soap before lunch breaks was observed to be 42%. This corresponds to an overall food-related handwashing rate of 23% in intervention schools.

Calculate change scores from baseline to follow-up separately for the control and the intervention group(s)

We then wanted to see more clearly how the behavioral factors and behavior itself changed over the period of the intervention in both the control and intervention groups. The graph below shows change scores of caregivers' behavioral factors for the control and intervention group. The change scores of the control group can be interpreted as the changes which would have occurred in the study population in any case, even without any intervention. Seasonal differences, for example, might cause such changes. In addition, the baseline survey might have affected such changes. In contrast, the changes in the intervention group show the general changes in the population plus the changes which were triggered by our intervention.

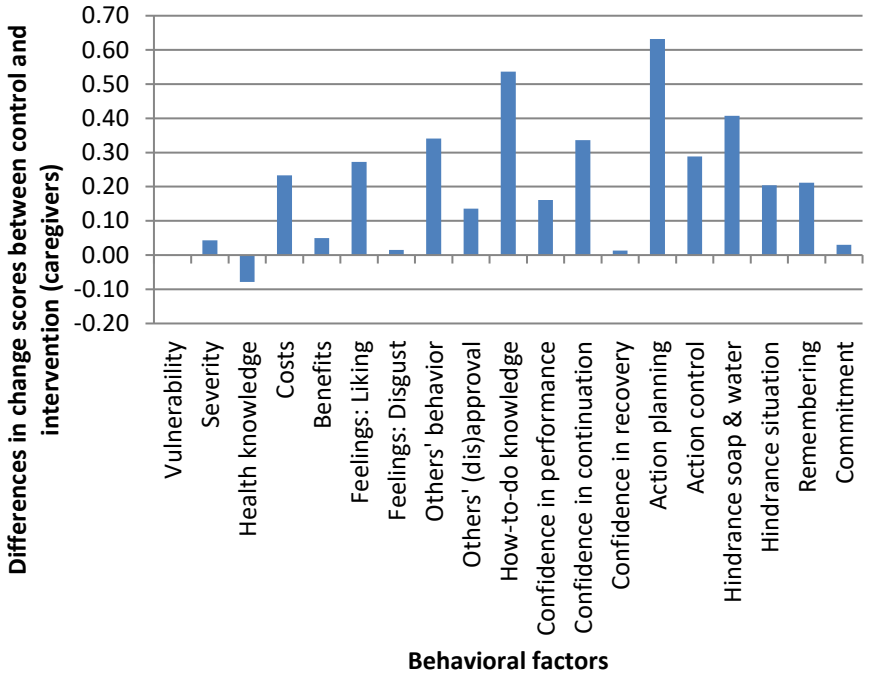


The graph displaying change scores of behavioral factors shows us that the largest changes over time occurred in the intervention group. For example, it shows that participants of the intervention liked handwashing with soap better after the intervention than before. In addition, participants perceived others to wash hands more frequently after the intervention than before. The graph also shows that some factors changed in participants of both the intervention and control groups in a similar way (e.g. *Commitment*), while for other factors (e.g. *Others' behavior*) the changes were of different magnitudes. For some factors, (e.g. *How-to-do knowledge*), changes even occurred in opposite directions. This means that participants of the intervention had a greater knowledge of when and how to wash hands after the intervention, while control households' knowledge had actually decreased between baseline and follow-up. We wanted to explore these group differences further, which brings us to the next key action.

The change scores of children's behavioral factors (not reported) were within a similar range.

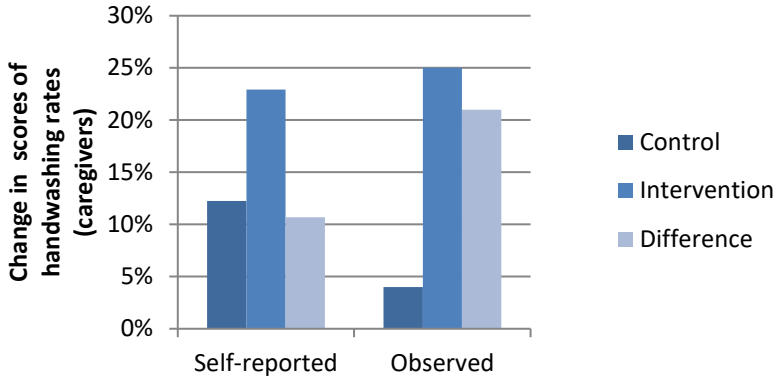
Compare change scores between control and intervention group(s)

In this last step, we aimed to find out which of the changes that we observed in the intervention group during the previous step were actually induced by our intervention. To do this, we compared the change scores between the control and the intervention groups by subtracting the scores of the control group from the scores of the intervention group. In other words, we subtracted the general changes which had happened in the population independently of our intervention (which we measured in the control group) from the aggregation of general changes plus changes which were induced by our intervention (measured together in the intervention group). This left us only with the changes that had actually been induced by our intervention. The results for caregivers are displayed below.



We can see that our campaign induced the strongest changes in *Action planning* and *How-to-do knowledge*. This means that it made participants more knowledgeable of when and how to wash hands with soap and supported them in specifying when, where, and how to actually do so during their daily lives. Further, participants perceived lack of soap and water as a greater barrier. At the first sight, this finding seems counterintuitive. However, we think that participants intended to wash hands more often, and became more aware of a lack of soap and water as a result. We can also see that participants were more confident in being able to continue washing hands with soap and water even if circumstances were difficult and liked washing hands with soap and water better than their peers in the control group.

Coming to the behavioral outcomes, self-reported and observed handwashing behavior of caregivers changed over time, as displayed in the graph below.



In the intervention group, the number of self-reported doers increased by 23%, compared to 12% in the control. Observed handwashing rates increased by 25% in the intervention group and 4% in the control group. This means that a 21% increase in observed handwashing rates can be directly attributed to the campaign, while 4% are attributed to a general change in the population.

With regard to the campaign's effects on children's behavior, no effects on stool-related handwashing were observed, since handwashing facilities at toilets had not been repaired as planned. Change scores of food-related handwashing for children in the intervention group were equal to the follow-up values (23%), because baseline values amounted to 0%. In addition, the difference in change scores between control and intervention groups amounted to 23%, because food-related handwashing in the control was 0% at both baseline and follow-up due to the lack of handwashing facilities. Consequently, the entire behavior change in food-related handwashing in schools can be attributed to the campaign.

Conclusions

This cases study showed how we applied Mosler and Contzen's practical guide, *Systematic Behavior Change in Water Sanitation and Hygiene,* to our project promoting handwashing in Harare, Zimbabwe. The aims of our campaign were to achieve substantial behavior change by systematically changing the participants' mindsets and to perform a quantitative evaluation of campaign effects.

In applying the first three phases of *Systematic Behavior Change*, we designed a handwashing campaign that was tailored to the specific characteristics of primary school children and their caregivers in Harare. In applying Phase 4 and performing a before-after control (BAC) trial, we provided unambiguous quantitative evidence on the effects that our campaign achieved on observed behavior.

The campaign successfully changed the handwashing behavior of both primary caregivers and school children. The fact that only part of the protocols was correctly implemented in the campaign suggests that effects of complete implementation would probably be stronger. Evaluation of long-term effects would be the next step to find out how sustainable the behavior change was.

We conclude that applying the practical guide *Systematic Behavior Change in Water Sanitation and Hygiene* led to an innovative campaign that produced tangible effects. Our aim was to illustrate the practical use of *Systematic Behavior Change* by describing the concrete application of each step; we hope to encourage practitioners to use it too.