Sustainability of hygiene behaviour and the effectiveness of change interventions: Lessons learned on research methodologies and research implementation from a multi-country research study

From 2000-2003 six research teams from six different countries in Asia and Africa undertook a research study into the effectiveness of hygiene promotion interventions and the sustainability of changes in hygiene behaviour. The experiences and findings gained through this research study are worth sharing. Not only because they give insight in these areas, but also in do's and don'ts when undertaking a longitudinal behavioural study.

The experiences and findings have therefore been brought together and made accessible to people interested in hygiene promotion and behavioural research. We made two booklets. This booklet (booklet 1) describes methodological issues related to the research. The second booklet describes the research findings and the implications these findings have for water and sanitation programmes. We sincerely hope they provide useful reading and that you won't hesitate to let us know your experiences.

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Lessons learned on research methodologies and research implementation from a multi-country research study

Booklet 1

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March 2004

Preface

This booklet is one of two produced as a result of an international research project on the sustainability of changes in hygiene behaviour. The study was carried out in 6 countries by: Network for Water and Sanitation, Kenya (**NETWAS**); WaterAid Uganda (**WAU**) working in collaboration with Uganda Association for Socio-Economic Progress **(USEP)**; Volta Region Community Water Supply and Sanitation Agency, Ghana (**VRCWSA**); Nepal Water for Health (**NEWAH**); COSI Foundation for Technical Cooperation, Sri Lanka (**COSI**); and Socio-Economic Unit Foundation, Kerala, India (**SEUF**). IRC International Water and Sanitation Centre, the Netherlands, coordinated the research and technical advice was provided by IRC and by the London School of Hygiene and Tropical Medicine, United Kingdom.

The study had the following objectives:

- To assess the level of sustainability of behavioural change one to three years after a hygiene promotion intervention;
- To develop a methodology for simple, cost-effective long-term monitoring of behavioural changes;
- To gain insight into relationships between project approaches, external conditions and sustainability of changes in hygiene behaviour;
- To determine the policy and programming implications of the study findings as a basis for influencing future policy and increasing the effectiveness of programmes.

The study lasted for three years. At various points along the way interesting findings and experiences were shared with outsiders.

Our practical research experiences and the lessons learned are recorded here in the form of two booklets rather than as a detailed, academic account. We believe this will best serve the interests of busy people requiring an easily accessible reference to the study and its outcomes.

This booklet (1) describes the methodological lessons learned during the study. Booklet 2 looks at how we undertook the research and outlines the findings.

Should you wish to discuss any aspect of this work or share your own experiences, please contact us. Our contact details are at the back of the booklet.

Delft,
March 2004

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These booklets could not have been written without our research colleagues:

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- Beth Karanja from Kenya
- Vincent Njuguna from Kenya
- Renuka Rai from Nepal
- Saraswati Khanal from Nepal
- Joyce Mpalanyi from Uganda
- Brenda Nahindu from Uganda

They gave much of their energy to the research, wrote research reports and gave us feed-back about the management of the research. For the authors it was just a matter of compiling, organising and consolidating the data and information provided by them.

We are also grateful to the directors of the organisations that participated in the research. They acknowledged the value of the research for their own programmes and allowed their staff to put in much more time than anticipated and budgeted for.

Table of contents

Introduction

Why study hygiene behaviour?

Diarrhoea, worm infestation and eye and skin infections are diseases related to water and sanitation. About three million children die from diarrhoea each year. Each of the three common worms (roundworms, whipworms and hookworms) is estimated to infect more than 500 million people. Roughly 6 million people have become blind from trachoma, an eye disease[1]. Good hygiene can help prevent much of this, saving lives and preventing illness. For example, it is estimated that washing hands with soap can reduce the risk of diarrhoea by more than 40%. Programmes to promote handwashing might save a million lives each year[2].

Simple hygiene behaviours – that is what people do, their practices for cleanliness – are key to improving health. Hygiene promotion is therefore recognised nowadays as an essential part of water and sanitation programmes if the maximum health benefits are to be gained from provision of improved facilities.

The challenge within programmes is to ensure that the necessary new, improved hygienic behaviours are developed and sustained and it follows that we need to assess the results of hygiene promotion efforts if we want to:

- Learn how to do it better. For example, the results of a study in a few communities can be useful in improving these activities in other communities that come into the programme later on.

1 Dr D.A.P. Bundy, Welcome Trust Research Centre for Parasitic Infections, Department of Biology, Imperial College, Prince Consort Road, London SW7 2BB, UK; and Dr E.S. Cooper, Tropical Metabolism Research Unit, Faculty of Medicine, University of the West Indies, Kingston, Jamaica.

2 Curtis, V., and Cairncross, S. (2003).'Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. In: *The Lancet infectious diseases*, vol. 3, no. 5, p. 275-281.

- Justify investments in hygiene promotion to funding bodies. A study showing improvement in behaviours can be used to advocate for hygiene promotion. This can be very useful if a programme tends to focus too much on construction and not enough on what people actually do, that is, their behaviours.

Studying sustainability of behaviours

From research we already know that hygiene behaviours do change as a result of hygiene promotion[3]. What is still largely unknown is which factors are more likely to determine change and the extent to which changes in behaviour are sustained over time. Do people retain newly acquired behaviour or do they slide back into 'old habits' when they are no longer in contact with or supported by programme staff?

This international study was undertaken to help fill this knowledge gap. In the accompanying volume we describe the outcomes of the research. This booklet covers various methodological aspects of the work and explains how to set up a behavioural study, combining quantitative and qualitative data in order to help understand not only how people behave, but also why they behave the way they do.

Why not study health impact?

Some people think that the effectiveness of hygiene and water/sanitation projects is best evaluated by studying changes in health or looking for a decrease in the prevalence of diarrhoea. Certainly one objective of these programmes is to improve health but studying health impact is not easy and does not usually lead to clear results.

A review of the published and unpublished results of the best health impact studies of the Water Decade stated that these health studies are not useful tools for project evaluation or for improving

3 Kanki, B. et al. (2004). 'An approach to studying hygiene behaviour in Burkina Faso'. In: Cairncross, S. Kochar, V.J. (eds). *Studying hygiene behaviour; methods, issues and experiences*. Delhi, India, Sage Publications. p. 189-201.

interventions. The results are unpredictable and unreliable[4]. For example, information about diarrhoea from clinic records is often inaccurate. It is also difficult to collect accurate information by asking mothers, who may not remember episodes of illness in their children or may have another understanding of what diarrhoea is.

In addition, disease patterns are affected by many factors other than hygiene, making a health impact study tricky to interpret. Such studies are also very expensive and they usually do not provide enough insight into how to improve interventions.

On the other hand we know that, if people begin practising safe hygiene, their health will usually be better protected. Therefore studying improvements in hygiene practices will also inform about improvements in health. Collecting information about behaviours is also usually easier than getting accurate information about health. For these reasons we opted for a behavioural study rather than looking at health impacts.

Approaches to measuring hygiene behaviours

There are basically two approaches to evaluating hygiene behaviour:

- **The summative or survey oriented approach** aims to assess, often at the request of a funding agency, whether (or to what extent) project targets have been achieved. It is the more traditional, quantitative approach where a researcher or a research assistant visits communities and households to collect information. The collection can be done in various ways, for example, asking questions from a questionnaire, carrying out group discussions, making observations, pocket voting. The results are written onto data sheets and then analysed in a central office. The information is used in the central office or by project managers.

4 Cairncross S. (1990). 'Health impacts in developing countries: new evidence and new prospects'. In: *J. Inst. Water & Environ. Man,* vol. 4, no 6, p. 571-577.
World Bank (1976). *Measurement of the health benefits of investments in water supply*. (Report; no. PUN 20). Washington, DC, USA, The World Bank.

In general, the benefits of this approach are that it is well-known, it is quick to enter the information on data processing sheets and the information can be collected by a research assistant with only a few days training. On the downside the answers to questions may not always be accurate and the information is not always given back to the community. We also sometimes hear that community members are 'over-surveyed' and become disinterested from repeated questioning.

- **The formative or participatory approach** is a community-oriented approach in which the researcher and research assistants are more like facilitators. They help the community to collect and discuss its own information about water, sanitation and behaviours. The data collection can be done in several ways. For example, people from the community may make maps or use rating scales. They can have group discussions, make observations of households, do pocket voting. Many of the collection tools are similar to those used in the survey approach but the people in the community take the lead in collecting and analysing information, supported by the research assistants.

  The major benefit of this approach is that it is motivational. Community members learn to look at their own community in new ways and want to take action. It can also be more accurate as the people involved check each other when they collect and discuss information.

  One drawback is that the research assistant needs careful training and practice because facilitation is more difficult than just asking questions and writing answers. This approach also involves more time in the communities and can therefore make this stage of the study more expensive.

  Ten years ago the results of participatory activities could not be quantified because the gathered information could not be recorded

in a numerical form convenient for analysis. Fortunately practical means are now available to 'quantify qualitative data'[5].

The precise balance between the two approaches depends on the objectives of the specific study and the preferences of the researcher. But there is wide agreement that it is best to combine several methods so that the results can be checked for consistency between them.

Collecting both quantitative and qualitative data is useful.

In our study we used a summative, survey-oriented approach but mixed with elements of the participatory approach. For example, in several countries the information from the survey was fed back to the projects and to the communities. This helped check the data and also helped motivate people for action to improve their projects.

5 For more information see: Postma, L, Wijk, C. van and Otte, C. (2003). 'Participatory quantification in the water and sanitation sector'. In: *PLA Notes*, no 47. p. 13-18.

Our study framework

We used a simple framework for the study. This framework helps to explain the nature of the booklets and their interrelationship. The framework is as follows:

Through a first round of data collection we established the **starting points** in which:

- people perform a certain level of hygiene behaviour and a certain level of sanitary conditions is in place;
- in and around the community the resources are identified that make this level of behaviour and sanitary conditions possible, such as local construction materials for latrines, a shop that sells soap, and people's knowledge.

We looked at **inputs** brought into the community through project interventions. These inputs included:

- hardware to improve availability and accessibility of water supply as well as availability of materials and knowledge for latrine construction;
- provision of training and mobilisation for hygiene promotion, either directly to the target group or indirectly through women's groups, youth clubs or teachers;
- peer motivation to encourage (or discourage) the community or family members in behaviours relating, for example, to handwashing or latrine use.

These inputs were aimed at improving hygiene behaviour. Improved hygiene behaviours, such as handwashing, construction and maintenance of latrines are called **outputs.**

By doing a second round of information collection we were able to determine whether outputs (i.e. behaviours) were sustained and which of the inputs (i.e. project interventions) were most effective in bringing about behavioural change.

Booklet 1 is about lessons we learned regarding methodological aspects of the study.
Booklet 2 is about how we did the study, the findings and their implications for future water, sanitation and hygiene programmes.

Who are the booklets for?

Booklet 1 is intended primarily for people wanting to set up a similar study. It provides useful information on how to do so and on how to avoid some mistakes of earlier studies. Booklet 2 is for those wanting to become more effective in their hygiene promotion efforts. It refers to the hygiene promotion methods seen to be most effective in bringing about behavioural change.

Those responsible for setting up a monitoring framework can also benefit from reading Booklet 1, since it provides ideas for monitoring indicators and for implementation of monitoring activities. That booklet will be useful also for water and sanitation programme managers and donors wishing to understand the challenges faced by researchers. For the same audience Booklet 2 will be of interest with regard to justifying investments in hygiene promotion.

How to use the booklets?

The booklets have been written in such a way that each can be read on its own, depending on your interest. Should you want to set up a behavioural study, the first booklet is most useful. If you are most interested in impact data and designing a hygiene promotion programme, the second is best for you.

Should you wish to order more copies you may do so by contacting IRC by mail, phone or fax or through our website (http://www.irc.nl/content/view/full/167).
The booklets have been produced in such a way that they may also easily be photocopied. Should you do so, please acknowledge the source.

A note about statistics

The benefits of studies such as this depend, in the end, on being able to understand the messages contained in the considerable amount of data that has been gathered. Sometimes that can be done by a simple comparison of numbers or percentages but on other occasions more sophisticated approaches, involving some statistical analysis, are needed if a meaningful interpretation of the data is to be obtained.

Both booklets refer at various points to some of the terms and techniques used in statistical analysis. These are fully explained in an Appendix (3), common to both documents. Readers may find it useful to read that short section before studying the relevant parts of the main documents.

Correct handwashing is a rather complex behaviour.

Behaviours we studied

There are many hygiene behaviours, but if there are too many in a study it becomes too complicated and gives rise to too much data. It makes sense to study those behaviours that are most important in preventing illness. According to WHO they include: handwashing, having and using latrines, safe disposal of infant excreta and storing drinking water safely. Our research therefore studied those behaviours.

Handwashing

Having clean hands is important to prevent disease. For example, one common way to get a cold, or serious diseases such as hepatitis A or diarrhoea is by rubbing your nose, mouth or eyes after your hands have been contaminated with germs.

Handwashing is a complex behaviour, for which several things are needed such as knowledge, skills and an enabling environment. Four elements that one can use as approaches to measure handwashing are:

- **knowledge** of handwashing times that are important for health reasons. These 'critical' handwashing times are usually considered to be: before eating, after defecation, after handling excreta of infants.
- **skills** in washing hands correctly. In practice this means rubbing both hands with a cleaning agent like soap or ash and using enough water.
- **enabling environment**, for example existence of a convenient location with soap and water for handwashing in the household.
- the person's **actual practice** of handwashing. Do people actually wash hands correctly at the most critical times?

Toilet use is an important hygiene behaviour.

Latrine use

Having and using a latrine can help prevent diarrhoea and worm infections. Most of the agents – bacteria, viruses and parasites – that cause these illnesses cannot, of course, be seen. These agents get into the body through the mouth or skin and are passed out in excreta. They can be passed from one person to another through unclean hygiene practices. One purpose of having and using a latrine is to remove human excreta from human contact.

Valerie Curtis of the London School of Hygiene and Tropical Medicine describes the problem this way: All people pass germs out in their excreta. Not all of it is dangerous but one gram of excreta can contain 10,000,000 viruses, 1,000,000 bacteria, 1,000 parasite cysts and 100 parasite eggs[6]. A low infective dose (only about 100 viruses or 10,000 bacteria) can make another person ill if it is passed to them via food, fingers, water or flies.

To have a strong health impact, latrines must be used consistently by all children and adults in the household. In our research, four components were studied:

- Presence of a **proper latrine** with a superstructure and door.
- Evidence of **latrine use**. For example, is there a clear path to the latrine, is there excreta in the pit, is the environment free from excreta?
- Evidence of **latrine use consistently by each person** when they are around the household.
- **Latrine is maintained**. The floor is clean, the hole or trap and the walls are free from excreta. The hole of the pit latrine is covered.

6 Curtis, V. and Kanki, B. (1998). *Happy, healthy and hygienic: how to set up a hygiene promotion programme. 1. Planning a hygiene promotion programme.* (Water, environment and sanitation technical guidelines series / UNICEF; no. 5). New York, NY, USA, UNICEF, Water and Environmental Sanitation Section.

Storing drinking water safely

Safe storage of drinking water means at least keeping it covered. In the Ghana study safe storage also meant that the container and storage area should be clean, there should be no visible particles in the water and there should be a dipper near the water container.

We looked at behaviours of men, women, rich and poor.

Looking for evidence of impact

Most studies of hygiene try to find evidence that the hygiene intervention had an impact. The research or monitoring looks for evidence that behaviours have improved as a direct result of the hygiene promotion. We did this by:

- Comparing with control groups; Comparing communities or groups that had hygiene education/promotion with those that did not have hygiene promotion.
- Using baseline data; Comparing hygiene behaviours before and later or after the intervention.
- Looking for direct evidence; Assessing whether the people who participated in certain project activities have better hygiene behaviours than those who did not.

Control Groups

One way to study project impact is by **using control groups that did not have hygiene promotion.** The idea is to compare communities or groups that had hygiene education/promotion with those that did not. If the hygiene programme really has an impact, then the control group will not perform as well as the group that had hygiene education or promotion. The hygiene behaviours of the people who were in the programme will be stronger and more frequent.

One word of caution: It is important to select the sample carefully. The intervention communities should really reflect the project population and not be 'showpiece' communities. The control communities should be like the intervention communities. They should have similar water and sanitation conditions and similar populations.

Baseline information

Another way to see whether the hygiene programme made a difference is to study behaviours **before** and **later** (after or during) the project intervention. Baseline data is usually collected in a survey of

the community before the project starts. Then the baseline is compared to data collected later, but using similar collection tools and questions. If the hygiene intervention had an impact, then there should be a change over time.

Example: Number of households having and using a latrine before and after the project.

Direct evidence

A third means of identifying impact is to **look for links between particular hygiene promotion inputs and hygiene behaviour outputs.** Hygiene promotion inputs are usually some combination of activities such as:

- mass activities (campaigns, drama, videos, camps, rallies, village councils), which include the production and distribution of hygiene education materials;
- group activities (training classes, meetings, formation of women's groups); and
- personal communications such as home visits, advice from a neighbour, advice from a child.

To find direct evidence of positive outputs we look for answers to questions such as:

- Do the people who participated in project activities have better hygiene behaviours than those who did not?
- Did more people who participated in hygiene promotion activities practise the hygienic behaviour than those who did not participate?
- Did more people who remember particular hygiene promotion activities practise the hygienic behaviour than those who did not remember?

This is interesting to study because programme leaders often want to know which hygiene promotion activities have greatest impact.

Observing practices often tells more than asking questions.

Methodology and lessons learned

Main research activities

In broad terms, our research had the following steps:

Initial meetings with researchers to design the study, develop the hypotheses to be tested, and to make drafts of the collection tools and questionnaires. It was also important to design the sheets (data input sheets) on which the information would be written.

Preparatory field work, which included activities such as translating the questionnaires into local languages, training field workers, field testing the data collection tools, correcting the tools. In our studies the training of field workers was combined with testing of the tools. At the beginning the research teams needed to get permission from communities, and in some cases from the projects, to carry out the research.

Field work, which included selecting the communities, sampling households, identifying community groups. Research assistants carried out the survey activities and recorded data on the data sheets.

Analysing the information, which included checking the data sheets for mistakes and 'cleaning' the data, making totals for each question and item, entering these into spreadsheets for further analysis. Finally, potential associations between the results were analysed, for example: Did people who remembered hygiene classes tend to perform handwashing better after the project had ended?

Documenting, disseminating and promoting the use of research findings at the national and international levels.

Booklet 2 has details on findings and implications of the research.

Developing hypotheses and choosing indicators

Clear hypotheses are important to provide focus to a study. Hypotheses are assumptions you want to test. For example, you may want to test the hypothesis that: "If water is near the house, then people will wash their hands at critical moments."

Indicators are the key variables to be defined and assessed for testing the quantitative hypotheses. In this case the indicators to look at are: the distance to the water source (time or distance of a round trip) and handwashing (whether and when it is done, the way it is done).

Curiosity is the foundation of hypotheses.

In general the following principles apply to the development of hypotheses and choosing the indicators associated with them:

- The hypotheses to be tested have to be useful and relevant to your programme and environmental situation. For example, the hypothesis: "If women have had primary school education, they

will sustain their behaviour washing hands at critical times" is not useful if you are in an area where women do not go to school.

- Limit the number of hypotheses you want to test. You are probably full of questions about the effectiveness of your hygiene promotion, but limiting yourself will keep analysis of the data collected manageable.

- Indicators have to be as specific as possible so that all data collectors will assess the situation in a similar way. For example, handwashing could be defined as: "Using at least 0,5 liter of water, and soap or ash, to rub hands in at least three different directions, after defecation and before handling food." However, these specific elements have to be connected to the hygiene promotion activities as they have been implemented. You have to ensure that you measure behaviour according to the elements that have indeed been promoted. If for example "rubbing in three different directions" was not part of the message to promote handwashing, this element should not be included in the handwashing indicator used to measure the effectiveness of the promotional activities.

- Do not choose indicators that you know were already common before the hygiene promotion intervention. In those cases the intervention did not make a difference.

Our experience

We did have to resist the temptation to include too many behaviours and too many hypotheses in our study. It soon became clear that this would lead to a huge research project, overwhelming us with a volume of data that was far beyond our capacity to handle.

We therefore focused on three key behaviours: handwashing after defecation, use and maintenance of latrines and keeping drinking water free from faecal contamination. These were chosen because they are the water and sanitation related behaviours indicated by the

World Health Organization as having the largest impact on people's health. They are also behaviours promoted in most water, sanitation and hygiene programmes, so our findings could be of interest to many people in the sector.

We ended up with a total of about 10 hypotheses per country. Basically they were the assumptions we made about hygiene promotion and about its effectiveness. For example: "If people have water close to home, they will continue to wash hands properly after defecation." Another hypothesis was: "If we teach people how to build a latrine, they will build and continue to use and maintain their latrine."

When questioning each other about our hypotheses we found that they required much more detail to become meaningful for our study. "What do you mean by 'close to home?' - 10 meters, 50 m, or 100 m? What was promoted as proper handwashing? - The use of soap, rubbing hands? What type of latrine did you promote? - A pit latrine with a platform and a superstructure with a door or could it also be a hole in the ground surrounded by poles and a cloth screen?" These questions helped us to define clear criteria for measuring inputs and outputs.

Unclarity about criteria can cause severe problems.

Developing data collection tools

Once it is clear what you want to find out, the development of data collection tools can start. There are a number of ways to collect data. Some require the use of your ears, others the use of your eyes.

Data collection tools include: interview forms, observation checklists, demonstration protocols, question lines for focus group discussions, and pocket charts. In Appendix I you will find a number of tools described.

In general the following principles apply to the development of data collection tools:

- Before developing the tools, you have to have a clear view of what exactly you want to study, and who you want to question or observe.
- Make sure you only collect data relevant to the hypotheses. There is a lot of interesting information out there and it can be tempting to try and collect it all. This is time consuming, expensive, and unnecessary; increasing the amount of data to collect will jeopardise its quality.
- Tools have to provide information that: 1) helps to test the hypotheses, 2) is as unbiased as possible and 3) increases insight and helps to improve hygiene promotion programming.
- Plan for a pre-test of the tools and a check that the proposed users have a clear understanding of them. If the tools are developed in one language and used in another, ensure translation forward and backward, to check that the meaning is not changed in translation. Also test them in the field. Reflect critically on the pre-testing results and adapt the tools if required.
- Design tools to make it as easy as possible for the data entry clerk to read off the responses and type them into a computer. Data entry errors, made during this process, are one of the most common sources of wrong data and the hardest to detect.
- For some issues a questionnaire is useful but just asking people questions from a questionnaire will not always give you reliable

information. This is especially true where hygiene is concerned. Many people know the 'correct' answer and may give you this, even if it is not true. Cross-check information that has the potential to be unreliable, using a different tool (this is called triangulation). This is relevant in particular to information on behaviour, where you might expect embarrassment or socially desired answers. Whereas, for example, people may say they use their latrine, only an inspection of the latrine will tell you whether it is actually in use.

- The use of participatory tools in a long-term study requires special care. Using such tools may easily become hygiene promotion interventions, thereby triggering behaviour change and disturbing the results.

Behaviour has three components:

- **Knowledge**: is best measured using open ended questions, such as "Can you mention the most important handwashing times?", using a questionnaire.
- **Skills**: are best measured by asking for a demonstration – for example, by asking "Can you show me how you generally wash your hands?" and recording the characteristics of the demonstration (whether both hands were used, soap, etc.) using an observation checklist.
- **Practice**: is best measured through spot observation; since people are unlikely to wash their hands or visit a latrine during a short visit to their household, proxies can be used, with an observation checklist. Observation of a household latrine will tell you whether people in the household are using it; observation of handwashing facilities (basin, soap, etc.) can indicate whether people are washing their hands.

Behavioural components

Our experience

The more precisely we formulated the hypotheses and the indicators (for example describing what we meant by 'close to the home', 'proper handwashing' and 'a latrine'), the easier it became to decide what we wanted to look at. In our study we had two data collection periods, one year apart. After the first round of data collection we assessed the quality of the data generated and adapted the collection tools where needed.

We felt that sometimes children were likely to provide more reliable information than adults, for example about latrine use or handwashing, because they were less aware of what is socially desirable. When asking children we had to make sure that adults were not prompting their responses, because that would make the information obtained from the children unreliable.

We wanted quantitative and qualitative information and we used a variety of methods and tools for the purpose - observation, structured interviews with a questionnaire, asking for a demonstration and pocket voting without discussion, focus group discussion and pocket voting with discussion. These approaches allowed us to obtain information about people's behavioural motives and, at the same time, it may have encouraged the respondents to be more aware of the usefulness of hygienic behaviour, without disturbing the study results.

Sampling

Sampling means collecting data from part of the total population. Sampling is used because researchers cannot study an entire population and do not need to. For example, you need only to eat one spoonful from a bowl of rice to know if you like it.

You don't need to eat it all to know the taste.

A sample is a small portion of the total number of people or of the total amount that is used to provide information about the whole group or the full amount. For our example the spoonful is the sample. On the one hand a sample size has to be big enough to allow for scientific analysis and on the other hand it has to be manageable with the resources available.

In general, the following principles apply for sampling:

- Samples can be made of different units, for example:
  1. *Households* (useful to measure household hygiene and so on)
  2. *Households with latrines* (useful to study latrine use and maintenance)
  3. *Women and men in the households* (useful for measuring personal hygiene such as handwashing and latrine use)
  4. *Community groups* (useful to study involvement in a hygiene intervention)

- Sampling can be done completely at random, but can also be purposive, whereby a set of criteria is used to make a first selection.
- Hygiene promotion usually takes place in communities, so these should be selected first. Although it is not perfect, one useful way to select communities is to begin with a number of characteristics of communities that you want to have included in the sample. Examples are:
  - Large and small communities,
  - Main ethnic groups,
  - Communities that are in water deficit and those that are not,
  - Communities near roads and those off roads.

  Then communities can be selected that have each of these different characteristics.
- Cluster sampling by, for example, first selecting five communities purposive[7] from which to select 10 households in each, rather than choosing 50 households completely at random, makes logistics much easier, without losing too much variety or representativeness. If the selected communities are very different from one another, this can cause a problem in analysis known as 'confounding' unless a stratified analysis is used. When cluster sampling is applied, the sample needs to be 50% larger than in cases where a simple random sample is used.
- Random selection of units (households or people) in your study area is the next step. It is usually very important to select households in a community at random. This means that each household has an equal chance of being in the survey (rich or poor, those near the road and far away and so on). If the households are not selected at random it can mean that the results of the sample survey will not be accurate for the whole population or community you want to study. This can happen, for example, if only households near the road are selected. A sample can also be affected if data collection is done only during the day when many people are in the fields or are working somewhere else.

7 Whereas purposive sampling can be useful, it has the negative effect of making the samples less representative in the statistical sense.

Example of how to sample at random

In a community, choose a starting point such as the centre of the community or a water point. At this place, throw a pen in the air, or spin a bottle on the ground to choose the direction to be followed. Choose every third household in that direction until you reach the edge of the community. Note that if no one is at home in a household, choose the next house in the line. When you have come to the end of the community, choose another direction using the pen or bottle and repeat the process until you have sampled the desired number of houses.

Random sampling is easy?

- Often you do not know the exact population size. This is not a major problem but the larger your sample, the more sure you can be that the outcomes are true, that they truly reflect the population. Sampling errors, the differences between the sample and the population, which can occur by chance, have to be minimised. They can be reduced by using a bigger sample.
- When planning for the study it is important to plan the sample size.[8] (For further information refer to Appendix 3).

8 To help select the sample size, there are simple programmes on the Internet such as: http://www.surveysystem.com/sscalc.htm

- When going to the household try to ask for the person who is at home the 'most often', which will often be the senior woman in the household. In your introduction explain clearly who you are and the purpose of the survey you are undertaking.

Our experience

In our study the following sample sizes were applied:

Samples in the six-country study

Country	Institution carrying out research	Sample size	Remarks
Ghana	VRWSP	10 communities 2001: 220 households (HH*), 20 schools 2002: 220 HH, 20 schools	Sample had 5 communities where intervention ended in 1998; 5 communities ended in 2000.
India	SEUF	3 communities, 346 HH 2002: 10 communities, 345 HH plus informant interviews	Intervention ended in different years from 1993 to 2000.
Kenya	NETWAS International	2001: 6 communities, 215 HH plus 6 women's groups 2002: 112 HH plus 6 women's groups plus one control group, 29 schools	One half of 2001 households were re-surveyed in 2002. Individual survey of women's group members in 2002; group interviews in 2001.
Nepal	NEWAH	6 communities 2001: 77 HH 2002: 150 HH 2003: 242 HH plus focus group discussions	73 HH in 4 hill communities were dropped from the study because of security problems. Two of the remaining 6 had 2-year interventions and were surveyed 2 times. Four had one-year interventions.

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Uganda	WaterAid - Uganda	6 communities 2001: 221 HH 2002: 180 HH plus group and informant interviews	2 communities in each of 3 ethnic groups.
Sri Lanka	COSI	6 communities 2001: 110 HH 2003: 150 HH	In 2003, there were 4 project (100 HH) and 2 control communities (50 HH).

*HH = Household

We selected *communities* purposive. First we wrote down the conditions we wanted to include: e.g. large and small, both main ethnic groups, peri-urban and remote. Then we noted the communities in the list which had these conditions, and made the selection.

Households were meant to be selected at random to make the sample representative. However, since we wanted to test hypotheses about latrine use and maintenance, we had to have a sufficient number of households in the sample that had a latrine. Where this was not the case through random sampling, we completed the sample with purposive selection of additional latrine-owning households. For example, after sampling 150 households, many of us had less than 50 latrines, so we selected more households with latrines until we had a total of 100 households with latrines. Local informants could identify households with latrines, but we had to ask them not to pick the richest houses only.

In general we learned that it may be best *not* to use exactly the same households in the study more than once. For example, in India, the sample households in one community were visited in 2001 and again in 2002. Surprisingly the scores improved even after the intervention

had ended. Some people said they remembered the earlier survey and even remembered some of the tools and questions. From this it was decided that there was a 'survey effect'.

The role and training of research assistants

Sampling reduces the amount of work to be undertaken but does not eliminate the need for sufficient human resources. The use of research assistants is very helpful, not only to ensure that all the work gets done, but also because the necessary training and supervising process allows the researcher opportunity to be critical of the tools developed.

In general the following principles apply when research assistants are involved:

- The quality of research assistants is of crucial importance for the quality of the data. You will have to make sure they are well trained in collection of quantitative and qualitative data and in data entry.
- In the course of a research project, there is a risk of 'losing' research assistants, either because they are underperforming and have to be dismissed, or because they are transferred or quit because they found a more permanent job. The risk of ending up with too few assistants can be mitigated by training a few more than needed. This leaves a margin so that if necessary, you can dispense with any who turn out to lack the discipline, honesty, intelligence and sensitivity required of a good assistant.
- It is an advantage for research assistants to have a certain level of education, but this should not be to the point of alienating them from the study population. People need to feel at ease with them. It is therefore also important that they are native speakers of the language in the study area and that they have a pleasant attitude towards community people.
- The training of research assistants has to focus on a thorough understanding of the indicators and the use of consistent criteria when judging, for example, the condition of a latrine or the quality of handwashing. It is useful to combine training with pre-testing of the tools.

- Communication and observation skills need to be included in the training as does instruction on correct completion of the survey tools.
- Make sure the research starts shortly after the training and pre-testing. This helps to ensure that the enthusiasm generated during the training and pre-test is maintained and that the information is fresh in the mind.
- Plan for supervision and quality control of the research assistants, otherwise there is a risk that one or more will start inventing data, thereby jeopardising the quality of the data set. Supervision and quality control may include organising peer review of completed survey tools, team meetings at the end of each day to discuss progress, spot inspection visits and repeat interviews for a sub-sample of households.

Regular supervision can help prevent irregularities.

Our experience

Most of us had a regular (even daily) get-together with the research assistants at the beginning of the data collection period, to discuss difficulties encountered and to check the coding forms. This helped us to detect flaws in the quality of the data, or even data that was contradictory.

Talking about the assistants' experiences helped to find out whether faults were caused by a lack of clarity in the collection tools, by insufficient understanding of how they should collect the data, or simply by their energy levels going down. Depending on the cause, we could determine remedial action, such as adapting the tools, additional training and re-interviewing a sub-sample of households together, triangulation of data using different data collection tools, or even just having a drink together to boost the energy level of the field team.

As part of their training, research assistants in Uganda went to a number of households to pre-test the tools as well as to practise their use and the coding of the answers on the forms. When discussing their pre-testing experiences and the coding results, it became clear that definitions of hygiene behaviours and facilities varied between the assistants. Some considered a 'hole with poles and cloth around it' to be a latrine, whereas according to others a latrine requires a superstructure made out of stones. Should this difference in perception have remained, we would have been comparing apples with pears.

Elements of a typical training programme are:

- Background about the research; its objectives and methodology;
- Role and responsibilities of the assistants in the research;
- Sampling of households for data collection; description of the sampling procedure and a demonstration;
- Explanation of the data collection tools;
- How to conduct household surveys through questioning, spot observation, asking for demonstrations and pocket chart voting, including 'climate setting' – establishing rapport with the respondents; practical exercises with role-play;
- The difference between non-participatory and participatory methodologies for data collection;
- How to code responses;
- Field practice and testing of tools;
- Adaptation of tools.

The field work

The field work stage requires careful management as it is here that the information about inputs and outputs is collected.

In general the following principles apply for the field work:

- Plan logistics, such as transport, accommodation and food and supervision. When planning, do allow for delays, since many unexpected things may happen.
- Before entering a community, obtain consent from local leaders and tell them you will give feed-back to them at a later stage.
- When entering into a household, be polite and modest. Explain what you have come to do, build rapport by first talking about the family, the weather etc. Only then ask the person you talk to whether he or she is willing to provide you with some information.
- In case you ask a child to do a demonstration, ask the adults to remain silent and not to prompt the child. Prompting will make the child act differently from normal.
- When doing the field work in different stages, the data collected

early on can be used to check the usefulness of collection tools and where necessary, to adapt them.

Our experience

Our study was a longitudinal one, meaning that we followed up the population over an extended period of time. We included two rounds of data collection, a year apart. After looking at the data collected during the first round we found that sometimes we had collected data that we did not use. We therefore could delete questions from the questionnaire or points from the observation checklist.

We also found that sometimes the criteria we applied were not appropriate. In Nepal for example, the team wanted to test the following hypothesis: "If the women have a certain level of formal education handwashing is sustained." Formal education was defined as having attended primary school for at least 5 years. The first round of data collection showed that hardly any woman in the study area fulfilled this criterion, which meant that nothing could be said about the relation between education level and sustained handwashing. For the next round the team changed the indicator to include "any form of formal or non-formal education".

Data analysis

The analysis of data usually takes as long as or even longer than the field work. We distinguish between data entry, data cleaning and the actual analysis that will allow us to give meaning to the data.

In general the following principles apply for data analysis:

Data entry and analysis requires skills and careful planning.

Data entry and cleaning

The first stage is to design a spreadsheet into which the data will be entered. Excel or a similar computer software programme can be used for this. Typically, each household will be represented by a row in the spreadsheet and each column will be for a different variable, such as: household number, research assistant's name or number, village name (or number), number of men, women and children in the household, presence of a latrine, etc. Note that numbers will be easier to analyse than names and also quicker to type into the computer. You need to choose how the responses will be converted into numbers; for instance, 'no' = 0, 'yes' = 1 and 'no data' = 9. Ideally, the data will be recorded on the questionnaires and observation checklists in this form; making the job of the data entry clerks easier helps to reduce the number of errors they will make.

Excerpt from data input sheet: Kenya

		Collects enough water	not enough water	time to collect = time needed for cooking ugali	much longer than cooking ugali	much less time than for cooking ugali
Question number		1	2	3	4	5
HH code	L = HH has latrine	1	2	3	4	5
1.01	L	1	0	0	0	1
1.02	L	1	0	0	1	0
1.03	L	1	0	0	0	1
1.04	L	1	0	1	0	0
1.05	L	1	0	0	0	1
1.06	L	1	0	0	1	0
1.07	L	0	1	0	1	0
1.08	L	1	0	0	1	0
1.09	L	1	0	0	1	0

- The next step is 'cleaning' the data. Almost the only way to detect data entry errors is to enter the data twice and use the computer to look for differences between the two spreadsheets. There may be other errors in the recording of the data, which can sometimes be found by consistency checks. For instance, if a household says they do not have a latrine, but claim to use it always, you need to check whether both responses can be true. If a yes/no response is coded 0, 1 and 9 as above, and you find a response of 5, a check is needed. The best time to check for such errors is at the end of each day of field work, when it is not too late to rectify them. However, some will inevitably slip through and a lot of time and effort is usually needed to find them and decide what to do about them. In

the end, some households may have to be dropped from all or part of the analysis.

- If the data was collected by several assistants, look for any differences between their returns. You may find that one has recorded responses which are different, or more or less variable than the others. This may mean that they have interpreted the questions or responses in a different way – or even that data has been falsified.
- The effort of data cleaning is an especially worthwhile investment. It is not a task to be delegated to a junior clerk as it gives you a feel for the reliability of the data which will be very useful when you come to interpret the results.

Results can be enlightening or raise questions.

Analysis

- When data has been entered in an Excel spreadsheet the first piece of analysis is to produce descriptive statistics by adding up the answers. For example: How many people have a latrine? How many people know how to wash their hands? To enable

comparison with other data, such as national census results, it is best to put these in terms of percentages rather than numbers of households. Having these percentages helps to compare your expectations with reality.

- Percentages can be used to answer questions such as: "How common is X?" To produce a percentage, you need to divide by a denominator, such as the total number of households. You need to be very clear about which denominator you use, and specify it when you report your results. For example, if you are reporting the percentage of householders using a latrine, did you divide by the total number of householders interviewed, by the number who replied, or by the number who own a latrine? It is usually best to use the total number interviewed, unless there is a good reason to do otherwise.
- The second stage of analysis is to compare the totals or proportions between communities and between years in the case of an extended term study, between adults and children, between various districts or villages. (You also need to compare them between different research assistants, as a check on the consistency of the data.) These comparisons may prompt the need for explanations, and these explanations might be found from your experience. This will sometimes trigger the need for further research.
- Not all the differences in survey results will be statistically significant. Some may just be due to chance, to random variations in your sample, especially if the sample and the differences are small. To check whether a difference is statistically significant or is just a random variation you need to apply simple statistical principles to arrive at a 'probability' value, usually denoted by the symbol 'p.' Details of how to do this are given in any statistics textbook[9], and various computer programmes, including Excel, can do it for you. It is sufficient to say here that, if p is less than 0.05 the difference that you are concerned with can be regarded as meaningful or 'statistically significant.' A p-value greater than 0.05

9 Kirkwood, B. (1988) / *Essentials of Medical Statistics* / Blackwell Science, UK 234 p

would indicate a chance occurrence, a random trend or movement that might easily be reversed if the survey was repeated.

- The analysis can be taken further, by looking for associations between different variables. For example, are people who have had more than two home visits more likely to wash their hands? The following table looks at the relationship between handwashing and home visits.

		More than 2 home visits?	
		Yes %	No %
Washes hands?	Yes	100	67
	No	0	33

The data in the table suggests that everyone who has received more than two visits washes their hands, while only two thirds do so if they have not been visited more than two times. The difference is very significant (p is less than 0.01).

- You have to be alert however, since results like this can also be caused by confounding factors. A confounding factor is a factor that is associated with two variables. This makes them seem to have a causal connection, whereas in reality neither causes the other. For example, if your sample is from two villages, A and B, and no-one in Village B received a home visit while everyone in Village A washes their hands, it is possible that some other factor associated with one or other of the villages is causing the apparent association in the table above. For example, if the people in village A are all fishermen, they may wash their hands to remove the smell of fish.

  The confounding problem arises especially when your sample comes from a small number of very different villages, districts or ethnic groups. Using stratified analysis, involving a separate table for each village (or district) is a way to prevent this. The best advice, though, is to get a statistician involved so that you can ask them for advice. Do this as early as possible, preferably when you are still defining hypotheses and designing your data collection tools.

- Understanding data is not always easy. You have to make sure that sufficient time is set aside to learn about understanding data.

People from different ethnic groups often have different ways of doing things.

Our experience

Our experience has shown that it is crucial to explain to researchers about some of the statistical aspects of research, about cleaning data and to show how to do it before carrying out the field work. In our case all the data sheets at the end of the first survey contained errors. In a couple of sheets the columns were out of order and did not match the numbering of the original questionnaires. There were blanks and some repeats.There were abbreviations in some sheets but no explanation of the meaning of the abbreviations. In some cases the communities were numbered but it was difficult to see which communities the numbers stood for. It required quite some effort to make up for these flaws.

We should have more carefully *collected background information* about the original interventions before the study. In the countries involved in our study the interventions varied and in some cases the researchers only found out about the interventions when they

collected the data. For example, in two countries (Sri Lanka and Kenya) while the water component of the project in selected communities might have been strong, the hygiene promotion and education was not intensive. Therefore there was little obvious impact on behaviours. Had this been known in advance it could have led to the selection of other communities.

In the first survey, *the answers to the questions were added* together. For example, if a latrine had a clean floor, walls, a door and a roof, it was given a score of '4', one point for each of the variables. But if, for example, it had a score of '2' we did not know which two of the four variables had been scored OK and we could therefore not determine what type of remedial action could be proposed to the organisation that had been responsible for the hygiene promotion. In the second survey we stopped aggregating the data and scored each item separately. We numbered the questions very carefully. However, it was done in a way that allowed us still to compare the results of the first and second surveys.

We found that in at least 2 countries (Nepal and Uganda), there appeared to *be major differences between regions/ethnic groups or in the project interventions.* This meant that the data had to be analysed separately for each group or 'stratified'. In some cases our samples were then too small for each group.

We had some problem of comparing things that did not match. For example, in Nepal there were some very interesting focus group discussions, but these discussions could not be quantified. This means that the information could not be entered into an Excel spreadsheet. Therefore the results of the focus group discussions could not be easily compared with the results of the questionnaires during the home visits. In Kenya, group pocket voting was done in meetings with women's groups. It was done very carefully but the voting within the group was anonymous. We did not know which women had voted

which way. Therefore the results of the pocket voting could not be compared with the results of the observations and questions in a particular home.

During the first round of the survey in several country studies (India, Nepal, Uganda, Sri Lanka) there were *interviews with 'informants'*. These were people, such as council women and local government members, who could answer questions about the original intervention and other special issues in the project. Overall, the results of these interviews were disappointing. Sometimes the informants seemed to answer very much alike, no matter how local conditions varied. There could be many reasons behind this problem. Perhaps the informants had difficulty remembering the original projects, or they wanted to please the interviewer… or perhaps the questions were not asked in the correct way.

The analysis showed some *surprising results* which were, at times, difficult for the researchers to accept. For example, in the Indian study, impact from the project was very clear even 7 to 9 years after the project had ended – but only for the women, not for the men. Then the project staff remembered that while the original water and sanitation intervention involved *both* men and women, the hygiene aspects were focused on the women. It was assumed that men in the family would learn from the women. However this did not seem to have happened.

Dissemination

Dissemination is the act of sharing and promoting the use of what you have found. Different groups of people will be interested in the outcomes of a study: sector professionals may want to know how they can alter their hygiene promotion activities to become more effective; programme managers may want information they can use to justify investments; researchers will be interested in advice on how to set up a behavioural study.

In general the following principles apply for dissemination:

- You have to be clear as to who you want to address with a specific dissemination product. **Imagine the audience.** Different audiences will be interested in different aspects of your study; the product(s) should be tailored to reflect this.

Different dissemination products for different audiences

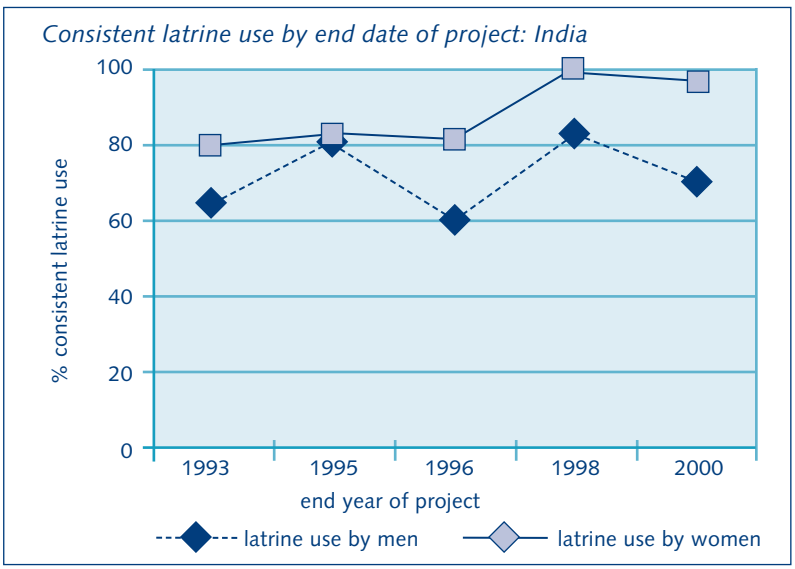
- Dissemination can take **different forms.** It can be done by publishing an article or a book, by a presentation at a conference, or by participation in a meeting.
- **Make a plan before you start** writing a paper or preparing a presentation, indicating the main points (in a booklet, the chapters) to be included. This will help to set the context for your work.
- **Dissemination is best done from the start of a study.** Dissemination is meant to create an interest in the study, to allow people to provide inputs in terms of questions they would like to see answered, which may be incorporated in the study. The more interest you can create at this stage, the better the acceptance of the results later.

- **Ensure a readable text:**
  - Use bullet points and keep sentences short by taking out unnecessary words. Use verbs, rather than nouns. Using verbs will make your sentences shorter and clearer.
  - Use only one idea per paragraph. It doesn't matter if it is only one sentence.
  - Focus on the main message (the reader should be able to remember at least two or three key messages). This should be included in the Executive Summary, where you will also inform your readers on what they will find in the rest of the document. State clearly the primary objective of the project and refer directly to the study results to show how they relate to that objective. In this case we wanted to know: "Is hygiene behaviour sustainable?"
  - Do not forget to include relevant background from all available sources. Ask colleagues to read your draft and give you feedback, especially on what is missing.
  - Separate results from discussion about results. Make sure you do not mix statements like: "We found this…." with "We think we found this".
- Sometimes you do not have 100% certainty about a study outcome. In those cases you may use phrases such as: The data suggests that…..; It appears that……; This may be because……; This is related to ……; This correlates with ……; As one increases the other decreases…; This supports the hypothesis …….(almost sure); This suggests that the hypothesis ……(more doubt); In our study we provided very strong evidence that……
- **Include tables in presentations.** Tables are 'vision', text is 'sound'. Keep the tables simple or even better, use graphs - they are easier to read. From Excel tables, different types of graphs can be drawn: column, pie (circle), bar (use labels), line (use text box to draw things in your graph) and scatter (with points), useful to relate or compare events in different villages. For example, for one of the countries, the table below showed latrine use for all communities where the project ended in different years.

Consistent latrine use reported in projects ending in different years

End date >	1993	1995	1996	1998	2000
Number of men	80	89	22	32	30
Number of women	98	130	31	57	64
Number of males latrine					
Use consistent	52	72	13	27	21
% of males latrine use	65	81	59	84	70
Number of females latrine					
Use consistent	77	109	25	56	61
% of female latrine use	79	84	81	98	95

The tabulated message is better illustrated in a graph:



Our experience

In our project, dissemination took place at national and at local level. It was also done at various stages of the research. We talked about the set up of the study as well as about the findings. This allowed us to get useful suggestions for the study design and created an interest in the outcomes.

In summary

This booklet looks at how to set up a study into the impact of hygiene promotion programmes on bringing about and sustaining new behaviours. The principles that we think apply to the various steps in setting up a research study are illustrated, together with our reflections on the experiences gathered during our particular international study.

Setting up a behavioural study is useful but complex. It requires careful determination of what you want to find out and how you are going to do it. A huge amount of enthusiasm and commitment is created if the research questions have a clear, obvious meaning to those in charge of the study. Their performance is improved too when they see that study findings can be immediately applied.

Time and effort has to be invested in training and supervision of staff involved in data collection, data entry and analysis. This will be time well spent in relation to the end quality of the study.

Studying hygiene behaviours rather than health impact

Hygienic behaviour has a positive impact on health. Studying people's hygiene behaviour is therefore useful if we want to find out whether water, sanitation and hygiene promotion programmes have an impact on the prevalence of water and sanitation related diseases. Behavioural studies make sense also because health impact studies are expensive and, for various reasons, are frequently not very reliable in their outcomes.

The following questions are amongst those helpful to ask when studying issues associated with changes in hygiene behaviour:

1. Which hygiene promotion efforts are most effective in convincing people to adopt hygienic behaviour where they did not do so before?
2. Which factors in the 'enabling environment' are supportive to behavioural changes?

3. Do people retain hygienic behaviour they adopted as a result of hygiene promotion interventions?

Designing a study

When designing a study intended to answer these questions keep the following crucial matters in mind:

Developing hypotheses and choosing indicators

Clear hypotheses are important in providing focus to a study. Hypotheses are assumptions you want to test. For example, you may want to test the hypothesis that, "If water is near the house, then people will wash their hands at critical moments."
Indicators are the key variables to be defined and assessed for testing the hypotheses. In this case the indicators to look at are: the distance to the water source (time or distance of a round trip) and handwashing (whether and when it is done, the way it is done).

Developing data collection tools

Once it is clear what you want to find out, the development of data collection tools can start. There are a number of ways to collect data. Some require the use of your ears, others the use of your eyes. Data collection tools include: interview forms, observation checklists, demonstration protocols, question lines for focus group discussions, and pocket charts. In Appendix I you will find a number of tools described.

Sampling

Sampling means collecting data from part of the total population, a technique used because researchers do not normally have the resources to study an entire population nor do they need to do so. A sample is a small portion of the total number of people or of the total amount. It is used to provide information about the whole group or the full amount. A sample size has to be big enough to allow for scientific analysis but small enough to be manageable with the resources available.

The role and training of research assistants

Sampling reduces the amount of work to be undertaken but does not remove the need for sufficient human resources. Using research assistants is very helpful, not only to ensure that all the work gets done, but also because the necessary training and supervising process allows the trainer opportunity to be critical of the tools developed.

The field work

This is the stage where information about inputs and outputs is collected. This requires careful management.

Data analysis

The analysis of data usually takes as long as or even longer than the field work. We distinguish data entry and data cleaning from the analysis that allows us to give meaning to the data.

Dissemination

Dissemination is the act of sharing and promoting the use of the research findings. Different groups of sector professionals will be interested in different aspects of the study. The form and content of specific dissemination documents or presentations must be designed with this in mind.

Appendix 1 Brief description of quantitative and qualitative tools

Quantitative tools

Observation

Observation means noting or absorbing information by use of any or all of the senses: seeing, touching, tasting, hearing and smelling. As it is impossible to observe everything at the same time and as we put our own interpretations on what we observe, observation can only be used as a reliable source of information when our observations are 'focused' and 'structured'. By 'focused' we mean that the observations are strictly directed at what we want to know, learn and understand. By 'structured' we mean that the observation follows a fixed plan, so that things are observed in a uniform, thorough, efficient and unbiased way. An observation checklist is one way of structuring the observation. It can be made to guide the data collectors for assessing issues such as latrine use and water storage. Spot observations are those which can be made instantaneously (for example, is there a latrine next to the house?) and are distinguished from extended observation (for example, when a research assistant spends several hours in each household and notes when hands are washed). In our study, we did not use extended observation, as it would have been prohibitively expensive.

Demonstration

Asking for a quick demonstration can also be used for collection of data, for example, asking household respondents or school children to demonstrate their handwashing skills during a visit. Clear protocols have to be developed in order to make sure people demonstrate what you want them to demonstrate in an unbiased manner.

Demonstration of handwashing, preferably by child or woman

Note: if child is not present, ask an adult woman if she would please demonstrate.

Child, could you please show me how you usually wash your hands?

If yes, ask the child or woman to show this in the place where people usually wash their hands.

> Ask others present not to correct the person or talk during the demonstration.

> Thank the person after completing the demonstration.

> Code this question afterwards, not in front of the family.

		Yes	No
	Is someone pouring water over the child's hands?		
	Uses some cleaning agent? (e.g. soap, mud or ash)		
	Rubs both hands together?		
	Subtotal (no. of times 'yes')		

Pocket voting

Pocket voting is a tool that was first developed by Srinivasan (1990) and was used to 'ask' people about their behaviour. Since pocket voting allows people to 'tell' by voting anonymously, the likelihood of getting reliable information is greater than when asking face to face.

This tool was originally intended to be used in a participatory way and at the level of a community, but it can also be used in a non-participatory way at the household level. Use of a pocket chart can be meaningful for data collection, in particular when people are hesitant to talk openly, for example about defecation places being used.

Qualitative tools

Focus Group Discussion (FGD)

This is an important tool for obtaining qualitative information. At the beginning of our research the FGD was used to test the usefulness of our hypotheses. We asked ourselves for example whether it made sense to look into the relation between handwashing practices and proximity to a water supply. If an FGD had revealed that all households had equal access to water, the testing of this hypothesis would not have been useful. Because such FGDs may trigger behavioural change and would therefore disturb the research, only people who were not part of the research study group were involved in the FGDs.

The other FGDs took place in the last round of data collection only. An FGD requires skillful moderation and the use of open questions.

Mapping

Mapping is a tool used with groups of community members. At several points in time they can be asked to draw a map of their community with special emphasis on, for example, water resources available or latrines built. Comparing and discussing maps can provide useful information with respect to changes that occurred.

Possible question line for a FGD to explore hypotheses related to sustainability of changes in hygiene behaviour

- I wonder if you all remember the hygiene campaign in this area.
- What did you feel about that campaign:
  - The people who led it?
  - The way they behaved?
  - The things they were urging you to do?
- Do you think it changed what people did at all? In what ways?
- What do you think affected whether people changed their behaviour:
  - Were certain behaviours easier to change?
  - Did certain groups of people change? Which?
  - Why did some people continue in the old days?
  - If it had been done differently, would that have convinced more people?
  - Do you think things were different in other villages?
- Has anyone continued with the new behaviour until now?
  - What has helped them to keep it up for so long?
  - What do you think has led others to give up?
  - If things had been done differently, what might have helped more people to continue?

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Appendix 3 P-value or Confidence level, Odds ratio and Confidence Interval

Commonly used terms in statistical research are p-value, odds ratio (OR) and confidence interval (CI). It is not necessary to know how these are calculated (computer programmes can do that for you), but some understanding of what they mean is important.

The simplest context in which they are used is when we are studying an association between two variables, such as (i) knowing how to wash one's hands correctly, and (ii) attending a hygiene education session. If the proportion of attenders who know how to wash their hands is the same as the proportion of non-attenders, there is no association. If there is only a small difference between the groups (say, 47% of attenders and 40% of non-attenders), the question comes up whether it has arisen by chance variation, or whether it represents a real association.

P-value

The p-value is the probability that the results could have arisen by chance. Probability is measured on a scale of 0 (complete impossibility) to 1 (absolute certainty), or 0% to 100%. If p = 0.1, or 10%, it follows that the probability that the difference is **not** due to chance (and therefore that there is a real association) is 90%.

Statisticians consider that an apparent association is 'significant' if the p-value is less than 0.05 (5%, or a chance of one in twenty). This does not mean that a p-value of 0.06 means that there is no association or that p=0.04 means that the association is proven. But this convention does help to focus our attention on the results for which the evidence is reasonably strong.

The p-value does not measure the strength of the association – only the strength of the evidence. For example, consider a sample of five men and five women, where three of the men had beards. In testing

this result for an association between maleness and beards, the computer would arrive at a p-value of 0.17, which is not significant. We would need a larger sample of men and women to show that the association was 'statistically significant'.

Odds Ratio

The odds ratio (OR) measures the strength of the association, by comparing the odds of something happening in two groups. To return to the example above on knowledge of handwashing, the odds of knowing among attenders are 47/53, because for every 47 attenders who know how to wash their hands, there are 53 who **don't** know. The odds among non-attenders are 40/60. That means that the odds ratio is:

$$OR = \frac{47/53}{40/60} = 1.33$$

The finding OR = 1.0 means that there is an equal proportion in each group. An odds ratio of 1.5 means the chance of good knowledge of handwashing is rougly 50% greater for attenders. If the odds ratio equals 4, the knowledge is several times more common in the people exposed to the classes than in those not exposed; in fact, the odds of their having that knowledge is four times greater.

Confidence interval (CI)

If the survey were repeated many times, we would expect the results to differ slightly each time. However one would also expect the results to fall near the 'true value'… more or less. To assess the range of this chance variation, researchers use the *confidence interval* (CI). This is set so that the true value is 95% likely to fall within it. It is sometimes called the 95% CI. By calculating the OR and the 95% confidence interval around your result, you can say that there is a 95% chance that the survey result and **true** OR both are near each other in this interval. If 1.0 is outside the CI, there is less than 5% probability that the true OR is equal to 1. (If it were equal to 1, there would no real association.) Thus we know that our old friend the p-

value is less than 0.05. Thus, the following statements are all ways to say the same thing:

$p < 0.05$
There is a statistically significant association.
The confidence interval does not include 1.0.

For example, some corresponding data from the Ghana study will look like this:

$p < 0.02$
OR=2.2
Confidence interval, CI 1.36 - 3.70.

This means that we are 98% certain that attenders had better handwashing skills than non-attenders, and reasonably sure (95%) that the people who attended the small group meetings are at least 36% (1.36, the lowest number in the confidence interval) more likely to have better handwashing skills.

These statistics: the odds ratio, and confidence interval can be used to study many questions such as:

- Did the households that performed better also have more project inputs?
- Were poorer people reached?
- Were people with less education involved?
- Were behaviours sustained or did behaviours become worse (deteriorate) over time?

There are several free computer programmes (such as EpiInfo 2000, which can be downloaded free from www.cdc.gov) and several websites (such as http://www.graphpad.com/quickcalcs/chisquared1.cfm) that can be used to analyse data.

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