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WATER, SANITATION AND HYGIENE:
SUSTAINABLE DEVELOPMENT AND MULTISECTORAL APPROACHES

# Using cell phones to monitor and evaluate behaviour change through community health clubs in South Africa

*J. Rosenfeld & J. Waterkeyn, South Africa*

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*Water and sanitation practitioners are challenged not only with developing interventions to enable the Millennium Development Goals to be reached, but also to show that their projects have achieved sustainable hygiene behaviour change. However, logistical limitations of existing data collection techniques have constrained the measurement of hygiene behaviour change. For over a decade the Community Health Club approach has proven that measuring behaviour change is feasible and can easily be performed through community-based monitoring. As the originator of this methodology, a South African based NGO is further refining an already robust monitoring and evaluation plan by using an innovative tool called the Mobile Researcher platform. This involves the use of cellular phones to conduct research and is proving an ideal tool for conducting community-based research in rural Africa, as demonstrated in the Integrated Water Resource Management project in South Africa.*

## Hygiene behaviour change

The trend in implementation strategies for water and sanitation programmes has come full circle, from the appropriate technology-driven interventions of the 80's through the participatory approaches of the 90's to the use of Social Marketing during the first decade of the new Millennium. Despite decades of attempts to improve living conditions, diarrhoea still remains a major challenge in developing countries. As past research has shown, the provision of improved water and sanitation facilities alone have offered limited success in reducing diarrhoeal diseases, but when combined with hygiene behaviour change interventions, incidences can be greatly reduced (Esrey et al, 1991 and Fewtrell & Colford, 2004). It is for this reason that health promotion is now considered an indispensible aspect of every water and sanitation programme. Increasingly, practitioners in this field are recognising the need to monitor and evaluate their projects, not only in respect to the number, quality and maintenance of latrines and water points provided, but also on social issues such as individual and community behaviour change. However, there remains a dearth of rigorous studies that can confidently assert the power of health promotion to achieve hygiene behaviour change (Curtis & Cairncross, 2003).

   Currently, we are being challenged by the MDGs to halve the number of people without access to safe water and adequate sanitation, but how are we actually going to measure any achievements made at present and demonstrate to practitioners and the sector as a whole what progress has been made by 2015? We not only have to meet the MDGs, but also to prove that they have been met and sustained over time. The problem is that we are so stretched just in implementation that many projects can devote neither the time nor the resources to effective monitoring and evaluation. Instead, this integral component of any successful intervention is often overlooked in the scramble to get on with the job of providing water and sanitation services.

### The Community Health Club methodology

Just this year alone (2008), the need for effective and successful strategies for health promotion was emphasized repeatedly at many different forums: Africa San Conference in Durban, World Water Week in Stockholm and PHASA conference in Cape Town. As highlighted in the closing remarks at World Water Week, 'hygiene behaviour change can be induced by Community Health Clubs,' indicating that the methodology described as the Community Health Club (CHC) approach is gradually being recognised as

one of the few strategies that can actually deliver behaviour change (Falkenmark, 2008). This methodology is now taking root in many countries and many contexts across Africa: in Zimbabwe, where it originated (Waterkeyn & Cairncross, 2005) health clubs have survived for over a decade despite the country's economic collapse; in Uganda CHCs have significantly improved hygiene and sanitation in IDP camps (Waterkeyn & Okot, 2005); in Sierra Leone, CHCs helped to reconstruct communities after the civil war (Kotze, 2002); in Guinea Bissau CHCs have been used in a programme to reduce infant mortality (King & dos Santos, 2007), and most recently in South Africa, CHCs have helped build social capital in informal settlements (Waterkeyn, 2007). All these programmes have succeeded in significantly changing hygiene behaviour, but how do we measure this success? How do we know when hygiene behaviour has indeed changed?

## Measuring hygiene behaviour

Reductions in the incidence of diarrhoea are difficult to measure through household questionnaires. Self-reported data is notoriously unreliable as people typically provide socially desirable responses or simply cannot accurately remember the last episode of diarrhoea. Although estimates of morbidity and mortality due to diarrhoea can be, and are often made, the actual percentage of people with diarrhoea among a large population is often so small that it is difficult to measure any slight changes that may have been induced by an intervention (Cairncross, 1990).

In response to the difficulties of directly measuring reductions in diarrheal diseases, an alternative method is to utilize proxy indicators to measure reductions in diarrheal diseases, as discussed in Box 1. This is feasible as academic research has categorically proven that diarrhoea can be reduced in households where the faecal-oral route has been successfully blocked through improved household hygiene practices, safe water and clean sanitation, (Feachem, 1984). As diarrhoea can be caused not only by unsafe water, but also unsafe food, and can be transmitted by the famous 5 'F's (Fingers, Food, Fluid, Faeces and Fruit), the reduction of diarrhoea depends on multiple improvements in home hygiene. Therefore, indicators can be identified that reflect improved hygiene and these should all be targeted by health promotion activities that seek to reduce diarrhoea.

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### Box 1: Proxy indicators of hygiene behaviour change

Proxy indicators are observable aspects of home hygiene that indicate non-risk hygiene behaviour.
A few examples used in CHCs are:

- Ask respondent to help you to wash your own hands instead of asking how they wash their hands
- Observing the presence of soap and water at a hand washing facility;
- Observing water storage practices; and
- Observing the status of latrines.

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### Data collection tools

There are many tools available for collecting data used to measure behaviour change. This paper will discuss those commonly used by practitioners in this field; paper-based surveys, Personal Digital Assistants (PDAs) and more recently, cellular phones.

### *Paper based surveys*

In the past, most field-based research has utilized paper-based surveys to measure project impacts, but human error is the main problem associated with this tool. The use of long winded questionnaires printed on paper often results in confusion over how to fill in the complex forms and follow complicated skip logic, while many surveys are spoilt due to sloppy entry by the enumerator. The laborious process of entering data from paper to computer introduces more human error as data can be lost or incorrectly entered, causing data to be less representative. Paper-based surveys also have logistical constraints: survey forms are sometimes lost or damaged and the planning and transport associated with collecting, printing and distributing reams of paper are daunting on a large scale. Finally, paper-based surveys require the hiring of local fieldworkers who must be fully literate in English (in Anglophone countries) and often fail to interpret questions and responses correctly into the vernacular.

*Personal Digital Assistant (PDA)*

Recently, Personal Digital Assistants (PDA) have helped to streamline research with more complicated questionnaire design and methodologies. PDAs are handheld electronic devices used to digitally enter data in the field. Although a 'sexy' technology and popular with well-funded and larger research projects, the use of PDAs is far from intuitive. They require sophisticated users, and a level of programming knowledge to format each device, upload surveys, and download collected data, which some practitioners do not have and therefore more in-depth training is required. PDAs do have the advantage of capturing Geographic Information System (GIS) data at the time a survey is conducted, enabling large scale surveys to be accurately linked with their spatial context. However, PDAs tend to be expensive and can malfunction and/or be damaged in the field by poor maintenance, making them less appropriate for many low budget projects.

*Cellular phones*

There is now a new technology that caters to all levels of expertise and education: the common mobile phone, which can be adapted to store and conduct digital surveys. Even in the most remote villages, it is not unusual to see a semi-literate herder wearing no shoes, but proudly using a cell phone to communicate with a world he has never seen. In recent years there has been a phenomenal uptake in the use of cell phones, with more than 2.4 billion users worldwide in 2006, 41% of which live in developing countries. Despite dire poverty, cell phone companies have had an instant success in Africa, where their use is growing twice as fast as any other region, increasing from 63 million users in 2004 to 152 million in 2006 (ITU World Telecommunications, 2008). Until recently, cellular phones have been used in health and development projects to link rural farmers with real-time market information or to assist patients with adhering to regimented treatment programs. Now, with applications like the Mobile Researcher platform, cell phones can enable health practitioners to conduct field-based monitoring and evaluation anywhere in the country.

## The Mobile Researcher

The Mobile Researcher is a platform that combines the reach and ease of use of cellular phones with a web-based portal for designing, deploying, managing and analyzing field-based surveys (see Box 2). Once the mobile application has been installed on a cell phone and a survey has been developed and published online, it is then sent to each assigned cell phone/fieldworker, where it is stored for future use. Fieldworkers only have to open the Mobile Researcher application on their cell phone to access their assigned surveys, which stores completed surveys before they are submitted to the Research Console. Since all completed surveys

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### Box 2: The Mobile Researcher platform[1]

The Mobile Researcher Platform is divided into two distinct units, which allow project staff to easily develop, deploy, conduct, and analyze data from field-based research: the Research Console and the cellular phone.

**The research console** is a web-based portal that centralizes all research related activities:

- Creates surveys with custom defined logic using a variety of question types and in multiple languages;
- No limit to the number of studies or survey's that can be developed and deployed;
- All surveys are easily deployed and updated on cell phones registered on the Console;
- Centralized, real-time management and supervision of all fieldworkers and research activities with built-in communication options;
- All data is uploaded in real-time; and
- Instantaneous analysis is provided.

**The cellular phone:**

- Many commercially available cell phones with Java and a web-browser can support the required mobile application;
- Easy to use interface utilizing common cell phone applications, like SMS and navigation keys, requires limited training of fieldworkers;
- Multiple surveys can be assigned and deployed to each cell phone/fieldworker;
- Each survey follows user-defined logic that removes guess-work or confusion on the part of fieldworkers; and
- Only requires network coverage to send and receive surveys, allowing research to be conducted where network connections are inconsistent or unavailable.

are automatically uploaded onto the Research Console, the need for lengthy and error-prone data entry is removed, improving overall data integrity and saving valuable time and resources. Despite these strengths, the Mobile Researcher platform is limited in two important aspects. With more emphasis being placed on community-based and led water, sanitation and hygiene initiatives, it is usually considered best practice to also include community members in the design, collection, management and analysis of project data wherever feasible. While the Mobile Researcher platform enables more people with less training to conduct research, it does not necessarily allow community members to control their own data, as the platform removes and stores all project data outside of the community. In addition, the collection of GIS data requires cell phones that are more expensive and less easy to use, like a Blackberry, thereby increasing the costs of research and the required skills of fieldworkers.

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**Box 3: The  Mobile Researcher & the medical research council of South Africa**

This technology was first put to more serious use as a research instrument to improve monitoring and evaluation of a health project in South Africa by the Medical Research Council (MRC). The MRC recently conducted a study in which more than 25,000 households were surveyed in less than 3 months, providing a total of 65,000 surveys. Using simple Nokia 2626 cell phones, the fieldworkers surveyed over 400 households every day, with the data automatically uploaded onto the online database and analysed before they returned to the field the following day. Research staff found it flexible, as they were able to pinpoint pertinent issues whilst the study was in progress (Medical Research Council, 2008). To date, this is the only other example of the Mobile Researcher platform being used to conduct field-based, public health research.

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## Africa AHEAD Community Health Club programme

### Community monitoring of hygiene behaviour change

One of the main strengths of the CHC approach is its ability to measure hygiene behaviour change (Waterkeyn, 2005). At the beginning of any CHC project, formative research is conducted within target communities to ascertain the main preventable diseases and the main risk practices associated with these diseases. Next, a 'syllabus' of between 20 and 25 health topics is drawn up by project managers and community leaders through focus group discussions that would be appropriate for the community to learn about and discuss. These topics are listed on a Membership Card that forms the basis of the CHC approach and makes the intervention more effective than other PHAST programmes (Waterkeyn, 2006).

Every member of a CHC is given a Membership Card, which provides not only a sense of identity and association with a dedicated group that meets weekly, but also a means of monitoring and evaluation for both the community and project managers. Every week a new topic is discussed, using visual aids and participatory PHAST activities to problem solve (Sugita, 2006). At the end of every session, the group is given a simple target to achieve in terms of one small change in life-style, habit or behaviour. For example, if the topic is 'Drinking Water', the discussion will focus on how to protect drinking water, and all members are together encouraged to endorse an undertaking, or 'homework', such as, 'By next week, everyone must have found a way to safely cover all drinking water containers'. Safe water storage then becomes one of the proxy indicators that are measured (See Box 1). One topic will be tackled each week for 20 weeks and by the end of six months there will have been at least 20 indicators that can be measured.

The strength of this approach is that each CHC monitors the changes within in its own membership. When a CHC is first formed, a Chairperson and Secretary are elected, who keep a register of all members (50-150 usually) and issue Membership Cards to each person who joins the club. The CHC Chairperson is responsible for ensuring that levels of hygiene are monitored by a trained club member. Using a simple exercise book, with columns for each indicator, they go from house to house and observe the living conditions. These observations are conducted on a monthly basis and the information is then entered into their exercise book, enabling each CHC to identify exactly when the agreed behaviour and lifestyle changes have been made. If a CHC is large, it can be broken into smaller groups, or clusters, (10 households), where a cluster leader is responsible for conducting this monthly monitoring. An outstanding example of this approach has been the work carried out in Teso District, Uganda (WEDA/WaterAid, 2007). This low cost, simple and effective method enables communities to track their own progress and to 'own' their own information, and consequently manage their own health without reference to the implementing NGO. Any 'problem' households are soon spotted by the CHC committee and remedial action can be taken locally.

Each CHC supports all members to improve their hygiene through group consensus and peer pressure as house to house visits by CHC members reinforce the selected target practices.

**Integrated water resource management and community health clubs**

Africa AHEAD has opted to use the Mobile Researcher platform to improve upon the community monitoring and evaluation plan being employed as part of the South African Government's Department of Water Affairs and Forestry's Integrated Water Resources Management (IWRM) project. In this project Africa AHEAD is piloting the CHC approach in two Water Management Areas (WMA) of South Africa[2].

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## Box 4: Case study: Good results hindered by difficult communication

The Household Inventory method of data collection and management by the community has recently been very successful in Zimbabwe, where despite a Government ban on NGOs field-staff operation during the recent elections, the community themselves were able to collect data through the monthly Household Inventory which was then collated by project officers using a simple Excel computer package (Zimbabwe AHEAD, 2008), as shown in Figure 1 below.

|  | Indicator | Before CHC % | After CHC % | Difference % |
|---|---|---|---|---|
| 1 | Refuse pit | 24 | 96 | 72 |
| 2 | Pot rack for drying dishes | 68 | 97 | 29 |
| 3 | Hand washing facility | 10 | 91 | 81 |
| 4 | Protected water source | 49 | 87 | 38 |
| 5 | Covered drinking water | 63 | 97 | 33 |
| 6 | Ladle for taking drinking water | 14 | 86 | 72 |
| 7 | No sharing of cups | 26 | 94 | 68 |
| 9 | Knowledge of SSS | 65 | 92 | 27 |
| 10 | Clean and used VIP latrine | 37 | 55 | 17 |
| 11 | Badza stand for cat sanitation | 1 | 45 | 48 |
| 12 | Bathroom | 21 | 82 | 61 |
|  | **Average** | **34.36** | **83.82** | **49.64** |

**Figure 1: Summary data from Zimbabwe AHEAD's community monitoring through household inventories**

**Good results**

These results show the CHC approach is effective in achieving high levels of positive behaviour change. With the 12 main proxy indicators, there has been an overall increase of 49.6% in good hygiene. All the targeted activities are practised by over 80% of the CHC households and six of them by over 90%. With 55% of household now having a latrine and the balance using cat sanitation (faecal burial) this means there is in fact Zero Open Defecation (ZOD) in all CHC areas.

**Difficult communication**

Due to the fact that all NGO staff throughout the country were grounded due to the political turmoil during the recent elections in Zimbabwe, Zimbabwe AHEAD's project officers were unable to collect this data, despite the fact that it had already been collected by the communities themselves. The report was therefore submitted late and the partner started to threaten to suspend support at this critical time! Had the Mobile Researcher platform been used for data collection, the data would have been easily collected and managed centrally, the statistical analysis would have been instant, and the donor would have had the reports on time. This provides a classic example of how the Mobile Researcher platform would have been the ideal monitoring tool, as it does not depend on a visit to the field by managers themselves. Instead, they could have received instantaneous data from each community, no matter how difficult the access or dangerous the area.

- South of Durban, where both Xhosa and Zulu populations live in the rural Umzimkhulu Municipality located in the foothills of the Drakensburg mountains of Kwa-Zulu Natal , where the programme is directly implemented by Africa AHEAD;
- North of Johannesburg in the barren North West Province, where local NGOs have been trained by Africa AHEAD to start CHCs[3].

Whilst only the base line data has as yet been collected for this project, we can at this stage assess the advantages, disadvantages, and overall cost-effectiveness of using cell phones, via the Mobile Researcher platform, for the purposes of monitoring and evaluation.

### *Monitoring and evaluation plan: Using the Mobile Researcher platform*

#### *In-depth case studies*
In each WMAs, three CHC villages have been purposefully selected as case studies to provide an in-depth understanding of each area. These selected communities will provide in-depth information about health and hygiene knowledge and practices as well as social capital and gender empowerment. Using the Mobile Researcher platform, trained facilitators (members of each participating community) are conducting this survey in an effort to characterize the overall impacts of the members' participation in a health club. To ensure that any behavioural changes continues to be sustained when the health sessions are completed, a post-intervention survey will also be conducted three months after the health sessions have been finished. Finally, each household will also be mapped using a handheld GPS unit so all data can be analyzed in relation to its physical situation.

#### *Monthly monitoring*
To compliment these in-depth case studies, every CHC member in all 60 CHCs will be monitored on a monthly basis using 12 observable indicators, which have been developed specifically for each area. Each club will be sub-divided into clusters with a trained cluster leader, who will, with the support of the facilitators, conduct these monthly spot observations of the physical facilities in each household. This information will be used by the community to track their own progress after each health promotion session and will be entered manually into an ordinary exercise book, kept by the cluster leaders. This system allows the data to be 'owned' by the community members themselves, so they can monitor their own progress and mange their health issues. In addition to the cluster leaders storing this data physically in their exercise books, the facilitators will also key this information into their cell phones every month. This data will be relayed to the Research Console, where results will be instantaneously received and utilized for monthly reports. In this way, behavioural changes at the individual, club and community level can be tracked on a monthly basis and graphs can show the degree of uptake after each session.

## Comparison of past and present monitoring and evaluation plans
If research becomes too expensive or logistically difficult, it can skew the budget and detract from the main objective of any health and development project, which is to improve family health in impoverished communities. Therefore, it is important to analyze if this new technology can stand up to competition from the 'old fashioned', but perceived cheaper option of paper-based surveys. As it turns out, paper-based surveys not only make conducting comprehensive monitoring and evaluation logistically challenging, but surprisingly, they may be more costly than using the Mobile Researcher platform. As the example below indicates a Household Inventory style survey has been done in two programmes associated with Africa AHEAD , in Zimbabwe in 2001 (Waterkeyn, 2006) and this recent survey in South Africa in 2008.

### *Comparative operational challenges*

#### *Comparative time taken*
The original CHC programme implemented by Zimbabwe AHEAD in 1997 was evaluated in 2001and consisted of 1,125 surveys in three districts in Zimbabwe. It took three months of data collection and a further five months of laborious data entry into a computer programme. At this point the data still had to be cleaned and analyzed, which took a further two months, making this process a 10 month struggle.

   By contrast, in South Africa in 2008 and 2009, an in-depth baseline survey was conducted by 5 fieldworkers in 4 sites across South Africa and a detailed research report was produced within one month. The survey had been developed, pretested, adapted and uploaded onto Nokia 2600 cell phones by the time the project was ready to start. Five fieldworkers were selected and after a few hours of training and a trial

run, the fieldworkers dispersed to their areas. Within two weeks, 350 surveys had been completed, with supervision made possible through the Research Console. Fieldworkers reported that the technology was easy to use and ideal for the purpose of collecting community-based data. As a result of the Research Console's streamlined data management and analysis, the Research Coordinator was also able to present statistical data within a few weeks of the projects beginning, which was integral to obtaining donor support for the project. The correct targeting of appropriate sites has enabled Africa AHEAD to better use its limited resources when trying to increase levels of water and sanitation coverage.

*Comparative safety of surveys and problems of missing values*
The frustrations associated with the Zimbabwe research were many. For example, one of the fieldworkers left a briefcase of 200 completed surveys on a bus while half of the control respondents from one area were missing. This data could not be re-collected due to time constraints and political turmoil in the area.

Equivalent problems have also arisen when using cell phones. For instance, one cell phone recently malfunctioned, providing incomplete data from some households and entirely losing data from others. These missing data were not noticed until each survey had been submitted, which has cost implications as submitted survey's are automatically deducted from the research account. Furthermore, fieldworker's cannot simply 'fill-in-the-blanks' of incomplete surveys, but instead are required to redo the entire survey. Secondly, while the Research Consol allows surveys to be altered and deployed in real time, if fieldworkers do not regularly check for survey updates it is possible that some data will be incomplete or obsolete. This has been identified as a problem with the monthly monitoring carried out by the facilitators in one site.

*Safety of the enumerators*
One key factor to consider is whether the research toll compromises the safety of the enumerator. In Zimbabwe, the issues were political where some had suspicions that the survey was a cover for opposition activities. These perceptions put the enumerators at risk in some areas. However, in South Africa, material wealth can make an enumerator a target for theft. The project is being implemented in some of the most impoverished communities of South Africa and smart new cellular phones can draw unwanted attention to the user. In fact, one fieldworker has already reported their concern that they have become a potential target for theft partially due to their public use of a new cellular phone.

**Cost: Comparative inputs**
In Zimbabwe the total cost of the survey (2002) to the donor in terms of field expenses was £26,600 (Waterkeyn, 2002). Thus, the cost per survey for data collection and input was £23.6, and the whole exercise took one year. If the same number of surveys were done under the system being used by Africa AHEAD at present, the total cost would be around R50,000 (£3,333), of which only 36% would be taken up in the cost of the technology, the balance being the cost of the fieldworkers. Not only is this a fraction of the cost, but it is relatively 'hassle free' and provides high quality data that is instantly available, and would take half the time to complete.

## Conclusions

The Mobile Researcher is a research platform that *'transforms the ubiquitous mobile phone into a cutting edge research tool by leveraging web and mobile phone technologies'* (Clyral, 2008). This combination of a centralized, web-based system for developing surveys and managing research activities and the common cell phone for conducting and submitting completed surveys allows researchers to conduct multiple studies simultaneously in multiple locations and languages. Overall, this technology has the potential to change the way in which practitioners at any level monitor and evaluate community-based projects in developing countries. However, to ensure that data still remains with the community, the Mobile Researcher platform should be used with a research methodology, such as the Household Inventory that incorporates community management of data, as demonstrated in the Community Health Club approach. This innovative technology is set to become a powerful tool for monitoring and evaluation and is particularly applicable to the monitoring of hygiene behaviour change. This heightened ability to research levels of behaviour change in health promotion programmes should in turn enable more rigorous research into the outcomes of health promotion programmes. Results from this research may also encourage dedicated funding for methodologies that can provide empirical evidence of positive outcomes. This in turn will assist countries to meet the MDG targets and contribute to the lessening of hardship due to poor hygiene in impoverished communities.

## Acknowledgements

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## Notes

1. The Mobile Researcher platform www.populi.net/mobileresearcher.
2. South Africa's DWAF/ IWRM : www.iwrm.co.za/index.html.
3. The CHC approach / Africa AHEAD/ Zimbabwe AHEAD : www.africaahead.org.
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**Contact details**

Jason Rosenfeld, MPH
136 Olympia House, Main Road, Kalk Bay,
Cape Town, South Africa.
Tel: +27762732163
Fax: +27217888855
Email: jason@africaahead.com
www.africaahead.org

Juliet Waterkeyn, PhD
95 Dorries Drive, Simon's Town, Cape Town, 7975,
South Africa.
Tel: +27217862664
Fax: +27217888855
Email: juliet@africaahead.com
www.africaahead.org