



A093239025

NCC/IBL AANVRAAGBON



(42)

19-08-2010

KOPIE PERIODIEK

Datum indienen : 18-08-2010 16:31 46638-1 IRC Int. Water and Sanitation Centre
 Datum plaatsen : 18-08-2010 16:31 Documentation Centre
 Aanvrager : 0003/0133 Postbus 82327
 Aanvraagident : 2508 EH
 Aanvragerident : 0003 NE
 Eindgebruiker :

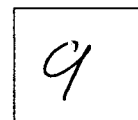
Telefoonnummer : 070-304 4005
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Plaatscode : 203631641 ; QA ; ; 1982 V16 -

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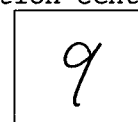
KOPIE PERIODIEK

19-08-2010

Datum indienen : 18-08-2010 16:31 46637-1 IRC Int. Water and Sanitation Centre
 Datum plaatsen : 18-08-2010 16:31 Documentation Unit
 Aanvrager : 0003/0133 Postbus 82327
 Aanvraagident : 2508 EH Den Haag
 Aanvragerident : 0003
 Eindgebruiker : tav

PPN Titel : 203631641,8
 Titel : Social science & medicine
 Auteur :
 Deel/Supplem. :
 Corporatie :
 Jaar/Editie : 199X Externe database:
 Uitgave : [S.l.] Extern nummer :
 Serie/Sectie : Elsevier Science
 Pag-ISSN/ISBN : 1873-5347

Plaatscode : 203631641 ; QA ; ; 1982 V16 -



Jaar : 2005-00-00
 Volume : 61
 Aflevering : 10
 Auteur : Cairncross S Aanvragerident. : IRCDOC
 Artikel : What causes sustainable changes in hygiene ...
 Bladzijden : 2212-2220
 Bron :
 Opmerking :



What causes sustainable changes in hygiene behaviour? A cross-sectional study from Kerala, India

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Available online 31 May 2005

Abstract

This study was designed and the field work carried out by a non-governmental organisation (NGO) responsible for implementing hygiene promotion. The sustainability of changed hygiene behaviour was studied at various periods up to nine years after the conclusion of a multifaceted hygiene promotion intervention in Kerala, India. Various methods including a questionnaire to assess knowledge, spot observation, demonstration of skills on request, and household pocket voting were used and compared for the measurement of the hygiene outcome. Pocket voting gave the lowest prevalence of good practice, which we infer to be the more accurate. Good handwashing practice was reported by more than half the adults in intervention areas, but < 10% in a control area. Handwashing prevalence showed no association with the elapsed time since the interventions, indicating that behaviour change had occurred and persisted. Recall of participation in health education classes was significantly associated with good hygiene as indicated by women's handwashing practice (OR 2.04, CI 1.05–3.96) and by several other outcomes, suggesting that the classes were an effective component of the intervention. The evidence for a specific impact on behaviour from home visits and an awareness campaign is less strong, although the home visits had influenced knowledge. The finding of an association between interventions and male handwashing, in ecological analysis (comparing administrative areas i.e. panchayats) but not at individual level, suggests that the effect of the interventions on men may have been indirect, via women or neighbours, underlining the need to direct interventions at men as well as women. The finding that hygiene behaviour persisted for years implies that hygiene promotion is a more cost-effective health intervention than previously supposed. © 2005 Elsevier Ltd. All rights reserved.

Keywords: Handwashing; Health education; Hygiene promotion; India; Pocket voting; Sustainability; Gender differences

Introduction

Inadequate water, sanitation and hygiene have been estimated to account for 2.2 million deaths annually or 4% of the global total, and 5.7% of the global burden of disease in disability adjusted life years (DALYs) (Prüss, Kay, Fewtrell, & Bartram, 2002). Most of these deaths are in children under the age of five (Kosek, Bern, &

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Guerrant, 2003). The millennium development goals stipulate that many more people should have access to improved water sources and sanitation by 2015 (United Nations, 2002), and also that the mortality of children under five should be reduced by two thirds. The mere provision of water supply and sanitation facilities is not enough to bring down mortality and morbidity rates significantly; hygienic behaviour has a greater impact on health (Fewtrell et al., 2005), and also helps to ensure hygienic maintenance of the facilities (Grimason, Davison, Tembo, Jabu, & Jackson, 2000). A hygiene promotion component is therefore recommended as an adjunct to most water and sanitation programmes in the developing world (WHO/Unicef, 2000, p. 34). Research has shown that hygiene promotion can change hygiene behaviour (Feachem, 1984; Curtis et al., 2001). What is still largely unknown is the sustainability and the relative effectiveness of the different approaches to hygiene promotion. Most of the existing literature is methodologically weak (Loevinsohn, 1990).

We report the results of a study in Kerala, India, which shed light on the sustainability of behaviour change. The study was part of a 3-year collaborative research programme on the sustainability of behaviour change carried out by eight organisations from Asia, Africa and Europe (Bolt, 2004; Bolt and Cairncross, 2004). The Indian partner was the Socio-Economic Units Foundation (SEUF), a professional NGO working with communities in Kerala to promote socio-economic development with a focus on water, environmental sanitation and empowerment of deprived groups.

The primary objective of the project was to study the degree to which induced changes in hygiene behaviour have been sustained. To do this, it was necessary that the study should assess the degree to which such changes had occurred in the first place. This in turn opened the possibility of examining associations between changed behaviour and the various components of the original hygiene promotion programme, and hence evaluating the relative long-term impact on behaviour of each component on each segment of the population.

Materials and methods

Study site and population

The study was carried out in ten rural panchayats (administrative areas), each containing from 20,000 to 40,000 people. Each panchayat is divided for administrative purposes into about ten wards having around 500 households each. Most houses are built on their own land along the roads and paths, in continuous rather than clustered settlements. Rural population density is high, ranging in the study area from about 800 to above 2000 people per square kilometre. Local government consists of an elected panchayat president and a council of elected members, one member per ward.

Strategy of prior intervention

The study focused on 10 panchayats in which interventions had been completed 2–9 years earlier. SEUF developed its sanitation promotion activities in Kerala from 1988 as part of the inputs in Dutch and Danish-supported rural water supply and sanitation programmes. By 2000, these activities had covered nearly 1.8 million people in 73 panchayats. The intervention aimed to provide permanent latrines to 50% of the poorest households (i.e. of those below the poverty line), and also to promote good hygiene practices among all households, working through local government and community groups.

The duration of intervention in each panchayat was not fixed, but depended on local circumstances. In practice, it usually continued long enough to organise and mobilize with local groups, and to achieve the agreed programme goals negotiated with the council of that panchayat. The sanitation implementation strategy followed four main steps, listed in Table 1. Latrine construction was only the third. The exact timing and duration of each step varied from one location to another in response to local needs and opportunities. Table 1 does not show the other programmes (water

Table 1
Implementation sequence in the SEUF sanitation programme

1.	<i>Beginning in a panchayat</i> Selection of panchayat, introductory meetings, survey and panchayat data collected, construction of model latrines, masons' training, costing of latrines, panchayat agreement, plan and contribution
2.	<i>Mobilisation</i> Community organisation and health education, household selection and contribution, education (technical and hygiene)
3.	<i>Construction</i> Pit digging, materials purchased and distributed, latrine construction, technical verification
4.	<i>Post-construction</i> Use and maintenance after construction, follow-up monitoring, documentation

supply, drainage, schools sanitation, etc.) in which the SEUF worked in all these panchayats. In most panchayats, the water supply activities were planned with the communities before sanitation started, but then construction of water supply by the Kerala Water Authority came after the household latrine programme.

At ward level, a water committee was formed of seven male and female volunteers, usually representing other local groups, such as youth, women's groups and local government. It was the lead group in the water and sanitation programmes in each ward and responsible for all health education activities. Local government, including elected officials and paid staff of local government services, helped to design the programme, organised local activities, provided accounting services, collected funds, provided their own funds and staff services, organised tenders, and so on, as a partner in the programme. A sanitation supervisor was employed by the panchayat to oversee the construction of latrines. SEUF deployed a field staff organiser for every one or two panchayats, to oversee health education and environmental sanitation work. This posting had lasted from 2 to 5 years.

Health education component

Step 2 of the sequence (Table 1) refers to two types of education and communication activities, which occurred at set intervals. The first was a period of general mobilisation, with a range of activities such as group meetings, exhibitions, health camps, films, and street drama, health clubs, and medical camps. It lasted 3–12 months, and aimed to increase demand and to inform people about latrines and their construction, cost and health aspects, with emphasis on the dangers of open defecation and its implications with respect to common diseases and accidents. The second education activity consisted of three sessions or 'classes', with attendance required of the families who planned to install a latrine. Each session focused on a specific topic; session 1 on health and hygiene, session 2 on technical aspects of construction, and session 3 on maintenance and use of latrines. Women usually attended sessions 1 and 3. Men attended session 2.

The content of the classes included the following topics:

- all family members, including children and men, should use latrines;
- washing both hands with soap or ash after defecation;
- keeping the latrine and its surroundings clean;
- other special issues for that family, ward or Panchayat;
- technical aspects included maintaining the water seal and preventing blockage, cleaning the latrine and emptying the pits.

The education activities were mainly carried out by health staff and Indian Child Development Service (nursery) workers in the context of their ongoing activities, as well as Panchayat officials, water committee members, and staff of SEUF who provided support, training and materials such as the pictorial instruction booklets and pamphlets which were distributed. Local youth clubs, women's clubs, voluntary agencies and ward members were trained in the health and hygiene aspects of the programme. Masons trained in latrine construction were also trained in imparting health and sanitation messages to their customers.

Special efforts were made to involve women, not only as a target audience, but in the organisation of activities at local level. This is common practice in the water and sanitation sector (Yacoob, 1991; Hoque, Aziz, Hassan, & Sack, 1994), and was done in recognition of women's central role as guardians of their households' health and hygiene (McCauley, West, & Lynch, 1992), as drawers and users of water, as inculcators of hygiene habits in their children and as those who stand to gain most from sanitation in terms of privacy, security and self-respect.

Almost 150,000 latrines were built—all double-pit, pour-flush latrines, with a squatting pan and, in most panchayats, complete superstructure. They were subsidised, with householders paying 20–25% of the cost and the local panchayat government contributing up to 40%.

Sampling

Data were collected in 2002 in 10 panchayats in which SEUF had been active in previous years. The panchayats were purposively chosen to offer a variety of conditions, in terms of socio-economic status, duration and intensity of intervention, and time elapsed since its completion. In each of the first nine panchayats, 25 households in two wards were randomly selected from the beneficiary list of the project provided by the Panchayat. In the tenth, 120 households were similarly chosen. This gave a random sample of 345 poor households each of which had participated in the project and received sanitary (pour-flush, 2-pit) latrines.

Data collection for this study

A short questionnaire was administered to each household. The question about handwashing was deliberately open-ended, and phrased as follows:

Thinking about good health, when are the most important times to wash hands for health reasons? (Do not prompt, let people speak freely.)

The questions were supplemented by a spot observation of the household environment and latrine, a demonstration of handwashing technique requested of the main respondent, and an exercise known as “pocket voting” (Srinivasan, 1990), in which all household members present were asked to declare their normal handwashing practice and latrine use when at home, by placing voting papers into labelled pockets fixed to a portable board. The “votes” were cast inside the house while the field workers were observing the condition of the household environment and latrine, so that the voting was not observed. However, men, women and children used voting slips of different colours, so that their votes could be distinguished at the count.

The questions put to the vote were:

When you are around the house, do you always use a good latrine?

Do you always wash both hands with soap?

For the sanitation vote, four pockets were provided, each with an illustrative photograph; these showed, respectively, a field with bushes, the sea shore, an overhang latrine built over water, and a sanitary latrine. For handwashing, the four options were: washing one hand only, washing both hands with soap and water, washing both hands but with water only, and not washing hands at all.

Pocket votes were cast by 515 women, 315 men and 223 children in the 345 study households.

Exposure to various aspects of the awareness campaign was assessed by a short series of questions. Respondents were asked whether the women or men of the house had participated in the sanitation awareness campaign, and to mention at least three of the activities; health education classes, a video or slide show, street drama presentations, and competitions were most frequently mentioned. They were also asked whether women had been involved in organising some of these, and how many home visits they had received from community workers.

In addition, key informants in each locality (past and present panchayat presidents and water committee members at the time of the project) were interviewed about the activities of the project in their area. Additional secondary data, particularly regarding sanitation coverage before and after the intervention, were collected from the records of panchayats, SEUF and the Kerala Total Health and Sanitation Mission (KTHSM).

Data analysis

Comparison between panchayats

The key informants were asked several questions about the project activities. The ward water committee in place at the time of the intervention was asked to list

the types of health promotion activities in their wards, and the panchayat presidents at that time to list the different government and non-governmental groups actively involved and trained. Their responses were given a score (no. of types of activity 0–5; number of groups 0–6). SEUF staff also scored the relative intensity of the project intervention and support for it in the study panchayats on a scale of 0–8; this was derived as the sum of the following four scores, each ranging from 0 to 2:

1. intensity of inputs by SEUF,
2. degree of support by different groups in the ward where the research took place,
3. degree of support from the panchayat Government and political parties,
4. level of involvement of the Ward Water and Sanitation Committee.

We now had three different scores, indicating for each panchayat the intensity of project interventions and local support for them. These were:

- (a) number of types of activity implemented,
- (b) number of groups trained,
- (c) the total of items 1–4 above.

With only two exceptions, the ordering of the ten panchayats according to all three scores was the same, indicating good agreement. The exceptions were two panchayats, each of which scored one point less for the number of types of activity than was required to maintain the ranking from the other two scores. As the agreement was so close, only the SEUF staff score was used as a general measure of intervention intensity in each panchayat.

The relative socio-economic status of each panchayat was established (on a scale of 0–5) using the Kerala State Government’s official socio-economic rating and also a rating by the staff, which ranked them in the same order, and was supported by other indicators such as the level of latrine coverage at the beginning of the programme.

Associations between the characteristics of the ten panchayats in the sample were examined by linear regression. An association was considered as significant when the 95% confidence intervals for r^2 and the β coefficient did not include zero. The method was analogous to that followed by Haggerty, Muladi, Kirkwood, Ashworth, and Manunebo (1994) who looked for associations between measured indicators of behaviour change and a scored measure of the efficacy of the hygiene promotion volunteer in each of their 18 village study sites.

Within panchayats

To control for confounding by the differences between localities, the analysis was stratified by panchayat. A Mantel–Haenszel weighted odds ratio (OR) was calculated for each association tested, with its 95% confidence interval (CI). For the number of home visits made, a variable which could take three values (0–5, 6–10 and 11+), a χ^2 test for trend, stratified by panchayat, was used.

Results

Descriptive statistics

Handwashing

Of a total of 515 women voting, 297 (57.7%) reported that they always wash both hands with soap. In 199/345 of households (or 57.7%), all the women present reported this. This was very similar to the proportion of households (197/345) in which the respondent volunteered “before eating” as a time when it was important for health reasons to wash hands, although more (315/345, or 91.3%) mentioned “after defecation”. When asked to demonstrate handwashing technique, 280/345 (81.2%) respondents rubbed both hands together with soap and water. Of the 266 women respondents, 225 (84.6%) used this correct technique. Handwashing by children and by men was less common; it was reported by 55.2% of girls, 47.7% of boys, and by only 126 (40%) of the 315 men who voted.

There was a strong association between knowledge of handwashing times, demonstrated handwashing skills and self-reported practice. Respondents were more likely to demonstrate handwashing correctly in households where all the women reported the practice (OR 13.4, CI 6.3–28.3), and also mentioned that it is important, for health reasons, to wash hands before eating (OR 2.4, CI 1.32–4.2).

Latrine use

Of 515 women, 461 (89.5%) reported by pocket vote that they always use a good latrine (i.e. one with a pour-flush pan, superstructure and double pit) when they are at home. Households in which all women did this were no more likely than others to have a clean and well-maintained latrine. More than 90% of latrines were clean and functioning in all major respects except the door, which was defective in 39.4% of households. On the other hand, the households where all women reported handwashing both hands with soap were significantly more likely to be among the 82% of households keeping soap and water near the latrine (OR 3.3, CI 1.52–7.1). Latrine use was reported by 80.0% of girls, 72.7% of boys, and 74.9% of men voting.

Exposure to awareness campaign

Of the 345 study households, there were women in 336; in 74.1% of these, the women remembered participating in the awareness campaign; however, of the 227 households where there were men, only 18.5% said that the men had done so. Health education classes were recalled by 83.2% of households, and by 96.8% of those where the women reported having participated in the awareness campaign. The association between these two measures of exposure was significant, but was not found among the men; those who participated in the campaign were not more likely to remember the health education classes. A video or slide presentation was recalled by 27.5% of households, though the distribution of this latter was patchy, with no households recalling it in one panchayat and all of them in another. Less than 10% recalled dramas or competitions. Most (88.4%) remembered the involvement of women in organising the activities, and half (53.6%) said that project masons had given out health messages. Two households in three (65.5%) had received more than five home visits, and 41.2% had received more than ten.

Comparison between panchayats

Overall data for the ten panchayats are shown in Table 2. These include scores for socio-economic status and for the intensity of intervention, as well as the duration and end date of the intervention and the latrine ownership rates for the panchayat as a whole before and after its implementation. The table also shows the prevalence of latrine use and handwashing with soap among men and women, self-reported by pocket voting. Note that every household in the pocket voting sample *owns* a latrine, though not all members of the family are necessarily using it consistently when around the home.

There was a close correlation between the combined score representing the intensity of interventions and strength of local support for them and the prevalence of handwashing among women, and also among men ($r^2 = 0.82$ and 0.88 , respectively). The self-reported prevalence of latrine use among women and girls was also strongly associated with this score ($r^2 = 0.65$, Fig. 1). By contrast, the use of latrines by men showed no discernible association with the intensity and support of the project activities, but was closely correlated with the socio-economic score of the panchayat ($r^2 = 0.85$, Fig. 2). There was no association between socio-economic score of a panchayat and its score for intensity of project activity.

The other factor which is closely associated with socio-economic status at the panchayat level is the initial latrine coverage; that is the proportion of households owning a latrine at the start of the project (Fig. 2).

It seems that the project had little impact on the habit of latrine use by males, as their rate of latrine use is still

Table 2
Characteristics of the ten study panchayats

Panchayat	Anjuthengu	Kadappuram	Kadakkavoor	Puthanchira	Neendakara	Mararikulam	Alappad	Kaipa-mangalam	Koippuram	East Kallada
SE status	0	1	3	2	2	4	2	3	5	5
Intervention										
End date	1993	1996	1995	1995	1998	2000	2000	1993	1995	1998
Duration (yr)	5	1	3	3	2	5	4	7	3	4
Intensity	3	3	1	4	4	4	8	8	5	7
Panchayat sanitation coverage (%)										
Initial	15	18	39	32	41	43	24	38	55	52
Final	41	55	72	87	87	75	71	100	85	72
Latrine use (%)										
Men	48	59	88	60	69	85	76	96	100	100
Women	68	81	72	85	97	92	99	100	100	100
Handwashing prevalence (%)										
Men	16	32	10	40	38	42	58	77	44	56
Women	22	45	13	48	38	68	82	84	69	75

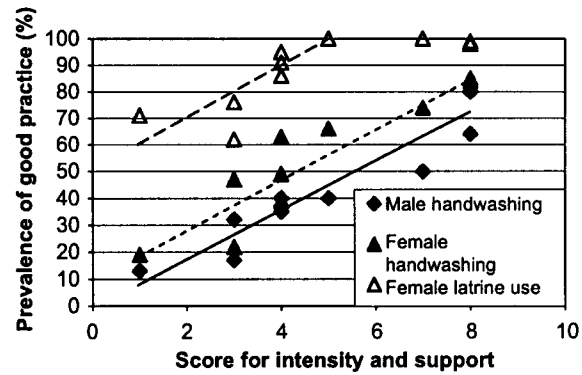


Fig. 1. Effect of intervention intensity on self-reported hygiene practices; 10 panchayats in Kerala, 2003.

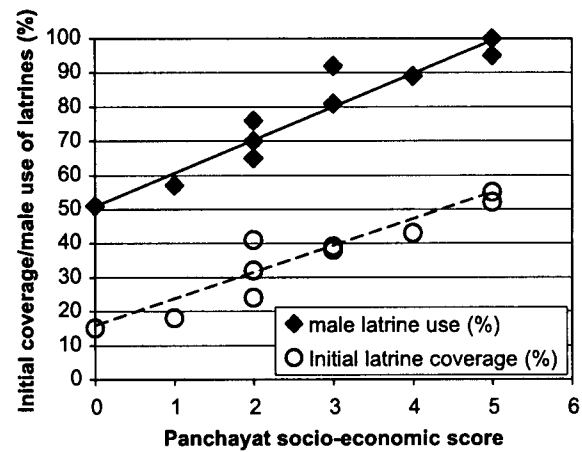


Fig. 2. Association of initial latrine ownership and male latrine use with socio-economic score; 10 panchayats in Kerala, 2003.

largely determined by the coverage with sanitation several years ago. Even now, they are more likely to use a latrine if they had one in the past.

Analysis within panchayats

All eight of the recalled measures of exposure to the intervention (household women’s participation, classes, video/slide shows, drama, competitions, women involved in organisation, masons giving messages, and the number of home visits) showed a positive association with handwashing reported by all the women of the household, although only one of these (health education classes, OR 2.04, CI 1.05–3.96) was statistically significant. That these associations are all in the expected direction is itself significant; the probability of it arising by chance is $2^{-8} = 0.004$. Handwashing by men, however, did not show any significant association with

any measure of exposure to the intervention, and such associations as were apparent were not so consistent.

Recall of health education classes was significantly associated with a number of other indicators of hygiene in addition to handwashing reported by women; knowledge that washing hands before eating is important for health reasons (OR 2.9, CI 1.43–6.0) and the observation that the household surroundings were free of faeces and other waste (OR 2.8, CI 1.22–6.6).

Since home visits are a particularly labour-intensive component of any hygiene promotion, their impact on knowledge as well as behaviour was tested. The number of such visits was significantly associated with awareness of the need for handwashing before eating (OR for > 10 visits 3.4, $\chi^2_{\text{trend}} = 5.59$, $df = 2$, $p = 0.018$), but not with other hygiene outcomes.

Discussion

The close association between three measures of handwashing prevalence—knowledge of appropriate times for health reasons, demonstration of technique, and self-reporting by pocket voting—lends support to their validity. Of these three, the voting gave the lowest estimate of prevalence. Since most measures are likely to overestimate prevalence rather than to underestimate it (Kanki, Curtis, Mertens, Cousens, & Traoré, 2004), we conclude that household pocket voting came nearest to the truth. Pocket voting has been used as a participatory tool at public meetings for many years (Srinivasan, 1990), but the extension of the method for use within the privacy of the home was developed for this study. The measurement of hygiene behaviour is difficult (Cairncross & Kochar, 1994; Almedom, Blumenthal, & Manderson, 1997). It is even more difficult to find quick and simple methods for use in the field evaluation of interventions, but it would seem that the three methods used here—or better, a triangulated compound of all three—could meet that need.

There can be no question that the knowledge and practice of handwashing with soap is far more common in the study population than in adjacent communities which have not benefited from hygiene promotion. In 2001, the same survey team, using the same field methods, had studied 120 households in Panmana, a nearby panchayat of higher than average socioeconomic status which had been chosen as a control because the sanitation promotion had involved no hygiene promotion component (Zacharia & Shortt, 2003). Only 7% of women and girls, and 3% of men and boys had reported handwashing with soap by pocket voting, and only 10% of household respondents had demonstrated correct handwashing technique (using soap and water and rubbing both hands together) on request. That half the population in the study areas report handwashing, and

that most can demonstrate it correctly, is a measure of the effectiveness of the interventions in changing hygiene behaviour.

Recall of health education classes was associated with outcomes assessed using very different tools: questionnaire relating to knowledge, and spot observation and household pocket voting relating to practice. This lends support to the conclusion that these classes are important to the effectiveness of the intervention. Another recent study (Waterkeyn & Cairncross, 2005) has pointed to the effectiveness of such classes when given as a programme of instruction fostering a collective commitment to put them into practice.

The home visits seem to have been less effective, with a significant impact on households' knowledge, but not on their practice. It is well-known that in hygiene as in other fields, knowledge alone does not determine practice (Pittet et al., 2004). However, hygiene promotion was not usually the principal objective of these visits, most of which were had other purposes such as collecting money, to checking the delivery of latrine materials, monitoring the quality and timeliness of construction, and so on. It would therefore be unwise to conclude from our study that home visits are less effective than classes as a means of hygiene promotion. Home visits have been an important component of a number of apparently successful hygiene promotion programmes (Dieleman, de Groot, & Nahayo, 1994; Bajracharya, 2003).

A similar caveat must apply to the awareness campaign. Many such campaigns are organised in Kerala, not always to promote hygiene, and some respondents may have recalled one of these rather than the one organised by SEUF.

The comparison between panchayats and with Panmana shows that the interventions had nearly as great an impact on the handwashing behaviour of men as on women. The lack of significant associations between male handwashing and exposure to the interventions at the level of individual households within each panchayat suggests that their effect may have been indirect, possibly via women and other members of the community. In any case, the interventions do not appear to have affected latrine use among men.

This appearance may be deceptive; latrine coverage increased by an average of 39% during the interventions in the ten study panchayats (Table 2), which must itself have increased usage to some extent. Since initial latrine coverage was associated with socio-economic status, the increase among the target group (poor households) must have been considerably greater. Nevertheless, it is not surprising that the impact of the interventions on male behaviour is harder to detect, as the interventions were largely directed at women, and key informants said that the population saw it as a women's project. A finding from this study is therefore that, in order to be fully

effective, such interventions need to be aimed at both men and women.

Our most important findings relate to sustainability. The difference in handwashing with Panmana mentioned above, and the association found between the prevalence of handwashing in each panchayat and the intensity of the interventions support the view that not only have the interventions caused a change in behaviour, but also that this behaviour change has been sustained since the interventions were concluded.

The lack of association between handwashing prevalence and the time elapsed since conclusion of the intervention—up to nine years in some panchayats—provides additional evidence of the sustainability of the hygiene behaviour change. Our findings agree with the results of the two previous studies of this topic of which we are aware. In the first, Wilson and Chandler (1993) found that 79% of mothers in a village in Lombok, Indonesia continued to wash their hands with soap, two years after a four-month intervention to promote the practice. The second was a follow-up study of a water, sanitation and hygiene promotion project in Bangladesh by Hoque, Juncker, Sack, Ali, and Aziz (1996), who found that hygiene practices in the intervention area were still poor after five years, but better than in the control area. In the latter case, it is difficult to say whether the sustained improvement in hygiene was the result of the hygiene promotion, or of the presence of the hand pumps and latrines (Curtis et al., 1995), most of which were still functioning; knowledge of the transmission of diarrhoea was similarly poor in both the intervention and the control areas.

Similar evidence of the sustainability of hygiene changes has recently been found in parallel studies in Ghana, Kenya, Nepal and Uganda (Cairncross & Shordt, 2004). The sustainability of hygiene behaviour change has important implications for the cost-effectiveness of hygiene promotion. Estimates of the cost-effectiveness of hygiene promotion (e.g. Varley, Tarvid, & Chao, 1998; Borghi, Guinness, Ouedraogo, & Curtis, 2002) have treated it as a continuous activity. Our finding that behaviour change is sustained implies that a hygiene promotion intervention can be of finite duration and still produce a benefit stream continuing for many years after its conclusion. It follows from this that hygiene promotion is far more cost-effective, in terms of DALYs per dollar, than such estimates would suggest, and several times more cost-effective than the promotion of oral rehydration therapy (Cairncross & Valdmanis, 2004). In view of the importance of this point for public health policy, further studies such as ours are needed.

Finally, this example shows that the local bodies which implement hygiene promotion in developing countries can, with appropriate technical support, carry out simple but rigorous studies of the impact of their own interventions, and develop new tools for the

purpose. The measurement of behaviour change has long been advocated as an appropriate means of project evaluation (Boot & Cairncross, 1993). We conclude that it is also a feasible one.

Acknowledgements

Support for the study was provided by the European Commission and the Netherlands Directorate General for International Co-operation, whose support is gratefully acknowledged.

References

- Almedom, A., Blumenthal, U., & Manderson, L. (1997). *Hygiene evaluation procedures: approaches and methods for assessing water and sanitation related hygiene practices*. Boston, USA: International Nutrition Foundation for Developing Countries.
- Bajracharya, D. (2003). Myanmar experiences in sanitation and hygiene promotion: Lessons learned and future directions. *International Journal of Environmental Health Research*, 13(Suppl. 1), S141–S152.
- Bolt, E. (2004). Are changes in hygiene behaviour sustained? *Waterlines*, 22(3), 2–3.
- Bolt, E., & Cairncross, S. (2004). *Sustainability of hygiene behaviour and the effectiveness of change interventions; II—Lessons learned on research methodologies and research implementation from a multi-country research study*. Delft: IRC International Water and Sanitation Centre.
- Boot, M., & Cairncross, S. (1993). *Actions Speak: The Study of Hygiene Behaviour in Water and Sanitation Projects*. The Hague: IRC International Water and Sanitation Centre.
- Borghi, J., Guinness, L., Ouedraogo, J., & Curtis, V. (2002). Is hygiene promotion cost-effective? A case study in Burkina Faso. *Tropical Medicine and International Health*, 7(11), 960–969.
- Cairncross, S., & Kochar, V. J. (Eds.). (1994). *Studying hygiene behaviour: methods, issues and experiences*. New Delhi: Sage Publications.
- Cairncross, S., & Shordt, K. (2004). It does last! Some findings from a multi-country study of hygiene sustainability. *Waterlines*, 22(3), 4–7.
- Cairncross, S., & Valdmanis, V. (2004). Water supply, sanitation, and hygiene promotion. *DCPP Working Papers Series* (No. 28). Washington DC: the Disease Control Priorities Project. www.fic.nih.gov/dcpp/wps.html
- Curtis, V., Kanki, B., Cousens, S., Diallo, I., Kpozehouen, A., Sangare, M., & Nikiema, M. (2001). Evidence of behaviour change following a hygiene promotion programme in Burkina Faso. *Bulletin of the WHO*, 79(6), 518–527.
- Curtis, V., Kanki, B., Mertens, T., Traore, E., Diallo, I., Tall, F., & Cousens, S. (1995). Potties, pits and pipes: Explaining hygiene behaviour in Burkina Faso. *Social Science and Medicine*, 41(3), 383–393.
- Dieleman, M., de Groot, F., & Nahayo, C. (1994). Education en hygiene au Burundi: Education par les pairs en pratique. *Promotion & Education*, 1(4), 11–17.

- Feachem, R. G. (1984). Interventions for the control of diarrhoeal diseases among young children: Promotion of personal and domestic hygiene. *Bulletin of the WHO*, 62(3), 467–476.
- Fewtrell, L., Kay, D., Enanoria, S., Haller, L., Kaufmann, R. B., & Colford, J. M. (2005). Water, sanitation and hygiene interventions to reduce diarrhoea in developing countries: A systematic review and meta-analysis. *Lancet Infectious Diseases*, 5(1), 42–52.
- Grimason, A. M., Davison, K., Tembo, K. C., Jabu, G. C., & Jackson, M. H. (2000). Problems associated with the use of pit latrines in Blantyre, Malawi. *Journal of the Royal Society of Health*, 120(3), 175–182.
- Haggerty, P. A., Muladi, K., Kirkwood, B. R., Ashworth, A., & Manunabo, M. (1994). Community-based hygiene education to reduce diarrhoeal disease in rural Zaire: Impact of the intervention on diarrhoeal morbidity. *International Journal of Epidemiology*, 23(5), 1050–1059.
- Hoque, B. A., Aziz, K. M., Hassan, K. Z., & Sack, R. B. (1994). Women's involvement in a rural Bangladesh water and sanitation project. *Southeast Asian Journal of Tropical Medicine and Public Health*, 25(1), 67–73.
- Hoque, B. A., Juncker, T., Sack, R. B., Ali, M., & Aziz, K. M. (1996). Sustainability of a water sanitation and hygiene education project in rural Bangladesh; a 5-year follow-up. *Bulletin of the WHO*, 74(4), 431–437.
- Kanki, B., Curtis, V., Mertens, T., Cousens, S., & Traoré, E. (2004). An approach to studying hygiene behaviour in Burkina Faso. In S. Cairncross, & V. J. Kochar (Eds.), *Studying hygiene behaviour: methods, issues and experiences* (pp. 189–201). Delhi: Sage Publications.
- Kosek, M., Bern, C., & Guerrant, R. L. (2003). The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. *Bulletin of the WHO*, 81(3), 197–204.
- Loevinsohn, B. P. (1990). Health education interventions in developing countries: A methodological review of published articles. *International Journal of Epidemiology*, 19(4), 788–794.
- McCauley, A. P., West, S., & Lynch, M. (1992). Household decisions among the Gogo people of Tanzania: Determining the roles of men, women and the community in implementing a trachoma prevention program. *Social Science and Medicine*, 34(7), 817–824.
- Pittet, D., Simon, A., Hugonnet, S., Pessoa-Silva, C. L., Sauvan, V., & Perneger, T. V. (2004). Hand hygiene among physicians: Performance, beliefs, and perceptions. *Annals of Internal Medicine*, 141(1), 1–8.
- Prüss, A., Kay, D., Fewtrell, L., & Bartram, J. (2002). Estimating the burden of disease from water, sanitation and hygiene at a global level. *Environmental Health Perspectives*, 110(5), 537–542.
- Srinivasan, L. (1990). *Tools for community participation. A manual for training trainers in participatory techniques*. New York: United Nations Development Programme.
- United Nations. (2002). *Report of the world summit for sustainable development, Johannesburg 26 August to 4 September 2002. A/CONF.199/20**. New York: United Nations.
- Varley, R. C. G., Tarvid, J., & Chao, D. N. W. (1998). A reassessment of the cost-effectiveness of water and sanitation interventions in programmes for controlling childhood diarrhoea. *Bulletin of the WHO*, 76(6), 617–631.
- Waterkeyn, J., & Cairncross, S. (2005). Creating demand for sanitation and hygiene through Community Health Clubs: A cost-effective intervention in two districts in Zimbabwe. *Social Science and Medicine*, doi:10.1016/j.socscimed.2005.04.012.
- WHO/Unicef. (2000). *Global water supply and sanitation assessment 2000 report*. Geneva: World Health Organisation with Unicef.
- Wilson, J. M., & Chandler, G. N. (1993). Sustained improvements in hygiene behaviour amongst village women in Lombok, Indonesia. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 87(6), 615–616.
- Yacoob, M. (1991). Women and water; the bucket stops here. *Agricultural Information Development Bulletin*, 13(4), 25–28.
- Zacharia, S., & Shordt, K. (2003). *Sustainability of changes in hygiene behaviours: Summary of study* (22pp). Delft, Netherlands: SEUF, Kerala and IRC Water & Sanitation Centre.