An intervention for the promotion of hygienic feces disposal behaviors in a shanty town of Lima, Peru

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Abstract
This paper describes the design, implementation and evaluation of an intervention to promote improved hygiene practices in a shanty town area of Lima, Peru. Following formative research, the intervention focused on behaviors associated with the hygienic use of potties by children aged 15–47 months and keeping the home environment free from feces. A health communications strategy was developed involving delivery through routine health services, and using video presentations, leaflets and counseling by health staff during consultations. Intervention activities occurred during a 6-month period in health centers and posts of four intervention communities; four other communities acted as a comparison group. Process and impact indicators were measured through questionnaires and 4-h structured observations conducted in over 600 households both pre- and post-intervention implementation, and through intervention monitoring activities. The intervention materials and approach were well received by the study community; however, in the time-frame of the project only limited coverage of the target audience was achieved, which was insufficient to result in an impact on behaviors. Nevertheless sufficient positive features existed to suggest that with higher coverage, an impact on target behaviors might have been achieved. Reasons for the intervention’s shortcomings are discussed and suggestions made for more effective implementation.

Introduction
Despite advances in the case management of diarrheal diseases, they are still one of the major causes of morbidity and mortality among young children in developing countries (Bern et al., 1992; Murray et al., 1994). Thus prevention of diarrheal disease remains an important public health concern. Much attention has been focused on the promotion of improved domestic and personal hygiene as a preventive strategy (Feachem, 1984; Huttly et al., 1997). While this has often been approached in the context of improving sanitary hardware such as water supplies and latrines, there is increased recognition of its independent value, i.e. even where sanitary hardware is poor or lacking, appropriate behavioral modification interventions can have a health impact. A review of 10 such interventions found a median reduction in diarrheal morbidity among young children of 33% (range 11–89%) (Huttly et al., 1997).

Although in 1993 the sanitary disposal of feces was identified by the WHO as one of three key water-related behaviors for promotion, it was recognized that little was known about disposal practices, their determinants, feasibility for change and health impact of related interventions (WHO, 1993). This was in stark contrast to handwashing, which was the sole behavior promoted in half of the studies reviewed by Huttly et al. (Huttly et al.,...
1.7 billion of the world's population lacking access to adequate sanitation (World Bank, 1992) and the low rate of use of latrines by young children (Huttly et al., 1994; Curtis et al., 1995) there is a need for development of appropriate interventions in this area. Such interventions pose a variety of challenges, and insufficient preparation and attention to design can lead to unsuitable promotion programmes and disappointing impact (Curtis et al., 1997).

We report here our experiences of designing an intervention to promote hygienic stool disposal practices in a densely populated shanty town area of Lima, Peru. We also describe the implementation of this intervention, which was delivered through the routine health services, and discuss the findings from process and impact evaluations.

Study site

The study was conducted in the upper area of the San Juan de Lurigancho district of Lima, which has a population of approximately 800,000. The district is densely populated and characterized by varying degrees of urban development, ranging from older, more-established areas to new squatter settlements. The principal occupations among men are self-employed street vendors, handymen and casual labor. Women also engage in such occupations, but a large percentage are based at home as housewives or undertake paid domestic occupations such as sewing or laundry (Yeager et al., 1999).

While a piped water system and sewers are present in many areas, especially the more established ones, they function sporadically at best, with water available for a few hours, 1–2 days per week. Situated on the arid coast above the Atacama Desert, there is no rainfall in Lima and where piped water is not available, water is sold by tankers. Some households have pit latrines, but the rocky terrain means the pits are usually shallow. Some of the more established households have flush toilets, but the lack of water makes them of limited effectiveness. Many adults and older children go to the rocky hills for defecation, but this rarely occurs for young children who stay around the home environment (Huttly et al., 1994; Yeager et al., 1999).

State-run health centers and posts are readily accessible in the area, including a small hospital. Health centers are usually staffed by at least one physician, nurse and technician, while health posts may or may not have physicians. The Instituto de Investigación Nutricional (IIN) has been working in the area since 1982 and has conducted many community-based studies, including of diarrheal diseases. These provided a good basis for developing the intervention and was the principal reason for selecting this area.

Designing the intervention

Based on their research in urban Burkina Faso, Curtis et al. identify five questions they addressed in designing a hygiene intervention and we followed a similar process (Curtis et al., 1997), they are:

- Which practices put children at risk of infection?
- Which practices are a priority for intervention?
- Which members of the community should be addressed?
- How can we build on perceptions of hygiene and diarrhea to motivate changes in behavior?
- What channels of communication and what materials are likely to be most effective?

We based the design of the intervention on formative research which is described in detail elsewhere (Yeager et al., 1999) and a summary is presented here. Data from interviews and structured observations were drawn on to begin development of a conceptual framework for behaviors associated with defecation practices and their determinants. This framework was further developed from information gathered through in-depth interviews and focus group discussions with mothers of young children, fathers and community leaders in the study area.

The practices

The multi-disciplinary project team, including the three fieldworkers who conducted the formative
research, analyzed approximately 50 hygiene behaviors identified in this research, in terms of their health impact and their feasibility of adoption (Academy for Educational Development, 1995). Feasibility of adoption was broken down into eight criteria: positive consequences of the behavior, compatibility with existing knowledge, similarity with existing behaviors, cost in money or resources, cost in time and effort, complexity, frequency, and duration. A score was given for each criterion by each member of the project team. At the end of the exercise, the scores were averaged and a combined score (impact + feasibility) was calculated for each behavior. The intervention was focused on the behaviors that had received the highest combined scores, which were those associated with the hygienic use of potties by children in the age group 15–47 months and keeping the home environment accessible to young children free from feces. Drawing on the Trials of Improved Practices approach (Dickin et al., 1997), the feasibility of adopting these behaviors was further tested in a micro-trial with a small group of mothers. Results suggested that development of an intervention to promote these behaviors was an appropriate next step (Yeager et al., 1999).

Motivating behavior change

Although infants wear nappies, the cost of washing means that mothers are eager for their children to move on to other methods. Potties are cheap (less than US$1), and widely available from street sellers and local shops. They are extensively viewed as the ‘best’ method for the toddler age group, but difficulties with toilet training are encountered and defecation on the ground is quite common (Huttly et al., 1994). The formative research explored the difficulties with potty use and incorporated this information into the intervention materials. It also showed that mothers were receptive to advice on such matters. Another important point arising from the formative research was that these issues are viewed not just as health matters for mothers. For example, use of potties was considered an issue of the child’s development, not simply a way to keep the environment clean. These ideas were incorporated into the way in which the principal messages were positioned.

Communication channels and materials

A team of health communications personnel was contracted to help develop the materials. Before this work was undertaken, however, it was essential to define the delivery mechanisms for the intervention.

The intervention was planned as a health communications package to be implemented through the routine operations of Ministry of Health (MoH) staff in health centers and posts in the target community, i.e. the intervention was to involve only activities which could be implemented within the existing framework of operations and not to include activities which could not be replicated on a wider scale. Initially we had hoped to compare such an approach with a more focused delivery involving special project teams. Funding constraints meant that we kept to an effectiveness rather than an efficacy trial, however.

The proposed project was enthusiastically approved by the MoH and complemented ideas they were developing on child development. They proposed that the most appropriate group to work with were the nurses and assistants at health centers...
in the Growth and Development Program (CRED), in consultation with the physicians. CRED staff undertake preventive activities such as growth monitoring, application of development tests and giving advice on nutrition. Generally they receive no specific training course when appointed to CRED. All mothers with young children who attend the health center are supposed to be processed by the CRED staff during the consultation.

The intervention strategy was to introduce the topic of potty use during these consultations and also in the outreach activities that CRED staff were required to carry out. Initial interviews were conducted with CRED personnel to discuss the project and its implementation, and to obtain suggestions for delivery of the intervention’s messages—the intention being to integrate the intervention with existing practices in the CRED service and minimize extra burden on staff. Three opportunities in which intervention messages could be delivered were identified—in the CRED consultations, in the outreach activities of the CRED personnel and in the waiting rooms of the health centers.

**Intervention materials**

Intervention materials were developed with these delivery opportunities in mind. The materials included a motivational video, a pamphlet, a song and a manual for health personnel on how to use the materials. Our choice of materials was informed by earlier success with similar approaches developed by the IIN and MoH in breastfeeding promotion and appropriate use of medicines for diarrhea treatment. Health center staff were particularly keen to include a video as, with World Bank support, the MoH was due to equip all health centers in the area with VCR facilities.

The video was intended for use both in health talks in the community by the CRED personnel and in the waiting areas of the health center. It runs for approximately 20 min, and focuses on the key issues of potty use and clearance of stools from the home environment. The story centers around a toddler, Jenni, who develops serious diarrhea through contact with feces of the neighbor’s toddler who defecates in their yard. Jenni is treated at the health center where the ‘problem and solution’ are explained, and the neighbor switches to using a potty for her toddler and to using the CRED facilities. These issues, however, are contained within a soap opera story which includes all the principal ingredients of such a style—drama, love, tears, misunderstandings, good and bad characters, etc. The script and ideas were validated with mothers before production. A song was developed for the beginning and end of the story, which at the suggestion of the CRED personnel was then taped and interspersed with other songs so that it could be played in the health center waiting rooms.

The pamphlet presented, along with other key messages, the ‘four steps’ to potty training—recognizing the child’s gestures for wanting to defecate, teaching the child to say ‘ca-ca’ when s/he makes these gestures, show the child the potty when s/he asks to defecate; and teach the child gradually to use the potty, helping by keeping him/her company. The messages and images were validated with mothers, and the pamphlets were made available in the CRED consulting rooms and distributed at community talks.

It also became apparent from our interviews with the CRED personnel during the development stage that as well as innovative materials, they would welcome assistance in training strategies. A stimulating, visually attractive manual was designed for them and used during the introduction of the intervention to the CRED personnel.

**Implementation**

The trial was planned with four intervention and four control communities, each community being a recognized sub-zone of the area with its own health facilities. Selection of the communities was made taking into account other health activities and projects in the area, their size, access, and security. Based on their geographical location and proximity, it was decided to allocate them to two groups in such a manner that would avoid ‘intervention contamination’ and make the groups comparable in terms of availability of facilities, time since establishment and, to a lesser extent,
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size. One of these groups was then selected at random as the intervention group. The approximate population sizes were 150,000 in the intervention group and 230,000 in the control group.

In May 1997, 10 nurses from the four intervention communities underwent two 3-h training sessions on the content of the communication materials and strategies for advising mothers. During these sessions they were asked to distribute pamphlets to all mothers attending CRED, to present the video during their community health talks and to show the video in the waiting areas of the health centers. After the training sessions, project staff visited the nurses once or twice to observe their presentation of the pamphlets to mothers during consultations and to offer suggestions for improvement. Project staff then visited nurses approximately once a week only to check pamphlet supply and to establish whether video sessions in outreach activities were scheduled for that week. The nurses were asked to continue their activities for a 6-month period (May–October 1997).

A mid-term meeting with the participating health personnel was held in August 1997 to discuss progress. Some minor modifications were made to address problems which could be remedied quickly. These modifications included assistance with loaning TV and VCR equipment as not all health centers had received the equipment they were scheduled to have from the MoH, and distributing pamphlet holders and mobiles to prompt nurses to remember about the topic in their consultations with mothers.

None of the above activities took place in the four control communities during the implementation period and the CRED staff in these areas continued with their normal duties. Later, these communities were visited by project staff who explained about the intervention strategy and delivered copies of the communication materials.

Monitoring

Various types of data were collected to monitor the intervention’s implementation. Exit interviews were conducted with mothers leaving the health center, consultations with CRED personnel were observed, pertinent data from the routine statistics were extracted and records were kept of relevant activities such as the number of video presentations made. Also, mid-way through the intervention a coverage survey was conducted in eight markets located close to the participating health facilities. Mothers of children aged under 5 years were identified at the market entrance during one weekday morning per market. The results of all monitoring activities up to that point were then presented to and discussed with the participating CRED personnel in the mid-term meeting.

Evaluation of intervention impact

The evaluation was designed to assess impact through comparing indicators pre- and post-implementation in the intervention area. Collecting the same data in the control communities provides a stronger basis for evidence of impact since indicator changes may occur for reasons other than that of the intervention’s implementation (Smith and Morrow, 1991). Assessment was made on an ‘intention to treat’ basis by including all the intervention sample in indicator estimates, irrespective of whether they took up the intervention. More detailed examination was made by comparing subgroups in the intervention area according to their take-up of the intervention. Evaluation data were collected from mid-October until early March 1997 for baseline information and during the same months a year later for post-intervention information. Data were collected by nine fieldworkers, all female and with secondary education.

Two types of evaluation indicator were measured—impact indicators which were the principal target behaviors, such as the use of potties by children aged 15–47 months, and process indicators, such as the level of exposure to the intervention messages. Other data collected to inform the impact analyses included characteristics of the households, knowledge and opinions of hygiene issues and other child-rearing practices, and other hygiene behaviors not the target of the intervention messages. In an attempt to reduce bias, the behavior indicators were measured through
structured observations conducted in the home rather than through reporting (Cousens et al., 1996; Manun 'Ebo et al., 1997). Behaviors other than the target ones were also recorded to try and avoid changes to normal patterns. Other data were collected through a structured questionnaire.

Sample size calculations were based on the key impact indicators. Since the intervention was delivered at the level of the community, the minimum number of four communities in the intervention and in the control group was selected (Smith and Morrow, 1991). The number of index children aged 15–47 months required in each group was estimated as 250, based on defecation occurring in 50% of structured observations, a power of 90% and statistical significance level of 5%, and levels of potty use after intervention of 50 and 30% in the intervention and control group, respectively. Data from the formative research phase and a similar study in Burkina Faso (Cousens et al., 1996) were used to inform these sample size calculations. Thus recruitment aimed for approximately 70 index children in each community. Based on results in the baseline period, this number was increased to 90 per community in the post-intervention period. This change was made due to the increasing availability of sewerage connections (albeit of limited effectiveness) which older children in our target age range were found to use.

Communities were surveyed in sequence, alternating between the intervention and control group. Each community was partitioned into eight sectors from each of which four or five blocks were randomly sampled using community maps. At least two households with an eligible child (aged 15–47 months) were selected from each block. Where more than one eligible child was present, the youngest was selected as the index child. This sampling strategy was used both pre- and post-intervention, i.e. a different sample of households were included at baseline from those selected a year later.

After obtaining informed consent, a questionnaire was administered—approximately 30–45 min. Permission was requested for the conduct of structured observations in the home in the following 24–48 h, and these took place between approximately 11 a.m. and 3 p.m. The main focus was on the index child and their caretaker, but pertinent observations of other children and household members were also made. Mothers were informed that the observations were to study aspects of childcare, but the specific hypothesis under examination was not revealed. The observations were event-based and recorded details of all defecation episodes and other activities such as food preparation.

The same procedures and instruments were used in the post-intervention evaluation as those employed in the baseline with the following modification. Data on coverage by the intervention were collected in all communities. In order not to influence observed behaviors, we opted to ask these questions at the end of the structured observations rather than during the questionnaire interviews, which came first. Our experience in the baseline period showed that it was imperative to conduct the interviews before the observations in order to gain the trust and confidence of the mothers. As a result, coverage data are only available on the smaller number of households where observations were conducted. To measure coverage, mothers were shown eight different health information pamphlets, including the study one, and asked which if any she had seen of them. For those who had seen the project pamphlet, they were asked questions on its content. Respondents were also asked about health videos viewed and, if it was mentioned, the content of the project one.

Quality control measures included substantial testing of the data collection instruments and repeat interviews by a field supervisor. Rigorous training of fieldworkers in conducting the observations was undertaken, particularly to standardize assessment of items involving subjectivity such as cleanliness ratings.

Ethical permission for the study was granted by the ethics committees of the IIN and of the London School of Hygiene and Tropical Medicine. Written consent was obtained from study participants.

Preliminary evaluation results were discussed with the CRED and other health center staff at
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Analysis
Data were entered and checked using FoxPro, while analyses were conducted using SPSS version 8.0 and Stata version 6.0. Comparisons were made between the intervention and the control group using the $\chi^2$-test for categorical variables and the t-test for continuous variables. The ANOVA test was used to compare means between several groups. Analyses were conducted at the level of the individual, but account was taken of the community-level allocation of the intervention when statistical significance was assessed, using the survey analysis procedure of STATA.

Results

Study communities
Evaluation data were collected from 285 households in the intervention area and 293 in the control area at baseline with corresponding figures of 362 and 360 post-intervention. At baseline the two groups of communities showed broadly similar characteristics except that the intervention area had slightly poorer sanitary and water resources and housing structure (Table I). The latter reflects the marginally higher proportion of more recent arrivals in the intervention area. One year later, minor changes were observed in some characteristics in both areas; in particular, slightly more households had access to sewerage connections and were constructed from cement (data not shown).

Intervention materials and delivery
Activities to deliver the intervention materials began simultaneously in all four communities. All CRED staff held a good supply of pamphlets, and began using the video in the waiting rooms and in outreach activities. The latter usually attracted a diverse audience and were held in locations such as local churches. The monitoring data from various sources showed that both the pamphlet and the video were extremely well received by both CRED and other health staff, and by mothers and other caretakers. The pamphlet was considered to be eye-catching because of its novel design and bright colors; the content was thought to be straightforward but informative. On all observed occasions (both in the waiting room and in the community talks), the audience easily recognized that the video’s story was set in a community similar to theirs and there was inevitably a discussion of which it could be. Audience reactions ranged from enthusiastic smiles to sorrow for the characters as the plot developed. They identified with the problems between neighbors and the main characters were classified in spontaneous comments as ‘the clean one’ and ‘the dirty one’. When asked about the important messages of the video, the audiences were able to separate the dramatic story from the hygiene-related messages, specifying the importance of potty use and maintaining the home environment clean. The soap opera style of the video was considered very innovative, and both staff and mothers requested that a similar approach be used for other health topics, rather than the usual ‘didactic lecture’ format. Finally, several women commented that they thought it was new, interesting and useful that potty training was being discussed with them by health personnel.

Feedback from the CRED personnel was very positive about the approach adopted in training them on the intervention materials and their implementation. In comparison to the usual approach adopted by the MoH, they described it as being more participatory, allowing greater dialogue between themselves and the trainers, and they felt their opinions and inputs were valued. The visits made by project staff after the training sessions were seen as supportive and non-threatening. The staff expressed a strong desire for the MoH to adopt this approach in future training.

Intervention coverage
Despite favorable opinion of the materials, the mid-term survey showed that intervention coverage was a problem. A total of 217 eligible mothers were interviewed, and about 10% had seen the pamphlet and/or the video. The post-intervention
Table I. Comparison of socio-demographic characteristics (percentage of households) in the baseline survey

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th>Intervention (n = 285)</th>
<th>Control (n = 293)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother lives with partner</td>
<td>yes</td>
<td>85</td>
<td>88</td>
</tr>
<tr>
<td>Family size</td>
<td>&lt;5</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>5–8</td>
<td>59</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>9+</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>primary or less</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>secondary incomplete</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>secondary or more</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>Father’s education</td>
<td>primary or less</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>secondary incomplete</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>secondary or more</td>
<td>55</td>
<td>56</td>
</tr>
<tr>
<td>Mother works outside home</td>
<td>yes</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>House ownership</td>
<td>owned</td>
<td>53</td>
<td>58</td>
</tr>
<tr>
<td>Years in Lima</td>
<td>&lt;5</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>5–9</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>10–19</td>
<td>32</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>20+</td>
<td>40</td>
<td>49</td>
</tr>
<tr>
<td>Possessions</td>
<td>fridge</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>TV</td>
<td>92</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>video player</td>
<td>9</td>
<td>4</td>
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<tr>
<td></td>
<td>sewing machine</td>
<td>19</td>
<td>16</td>
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<tr>
<td></td>
<td>blender</td>
<td>51</td>
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<td>6</td>
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<td></td>
<td>gas stove</td>
<td>42</td>
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<td></td>
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<tr>
<td></td>
<td>cement</td>
<td>52</td>
<td>65</td>
</tr>
<tr>
<td>Floor</td>
<td>earth</td>
<td>50</td>
<td>44</td>
</tr>
<tr>
<td>Water supply</td>
<td>piped supply</td>
<td>75</td>
<td>83</td>
</tr>
<tr>
<td>Sanitation</td>
<td>no sewage/no latrine</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>sewage/no latrine</td>
<td>58</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>no sewage/latrine</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>sewage and latrine</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

aProvides water at most 2–3 times a week.
bSewage drains but usually without water so of limited effectiveness.
cAlmost all ‘latrines’ are shallow dry pits without ventilation.

Data showed that 19% of mothers of eligible children in the intervention area had either received the pamphlet and/or seen the video. One percent of mothers in the control area also stated they had received the pamphlet; none had seen the video. Data from the exit interviews (held unannounced outside health centers) and from the number of pamphlets distributed compared to the number of CRED consultations suggested that approximately 40% of mothers/caretakers consulting received the pamphlet. The exit interviews showed that most of these women accurately remembered the first step in potty training as described in the pamphlet; however, few could specify all the steps, although most intended to read the leaflet at home. In the period September–November 1998, the video was showing in the waiting room of each health facility for a maximum of 10% of consultation time (i.e. one morning per week).

In the intervention area, the proportion of mothers who had seen the pamphlet/video (‘exposed to the intervention’) varied according to certain factors (Table II). Coverage was higher in the community where monitoring data suggested
that the CRED personnel had been more active in promoting the intervention, e.g. more frequently using the video in health talks and the pamphlets in consultations. Overall, 64% of children were reported to have been taken to a health facility in the 6 months prior to interview, although not necessarily one of the study facilities. Attendance was more frequent for younger children and thus there was also a tendency for intervention exposure to be higher among this group. Interestingly, mothers with more years of education were more likely to be exposed, even after controlling for community and the child’s age. We explored this issue with the CRED personnel in the final debriefing meeting. In direct questioning, the staff reported that they treated all mothers equally. Earlier in the meeting, through indirect inquiry, it appeared that staff think some mothers have difficulty in understanding health information and there was the suggestion that less time is invested in such mothers. It is plausible that less educated mothers are in this category.

The CRED staff discussed several reasons for the low coverage. There are certain topics which they are required by the MoH to cover in their consultations and for which they have to complete information in recording forms. Due to changes in the internal policies of the MoH during the project period (e.g. a new policy providing free and priority medical care for all school children), nurses became even busier than before. They are always under pressure to reach certain targets established by the MoH and their ‘productivity’ is evaluated frequently. Three of the nurses that had been trained by this project were released from their posts after poor evaluations by the MoH. The nurses were very open in stating that non-mandatory topics such as ours took a lower priority in their consultations, especially when demand was heavy. The same was true for planning health talks in the community where they were more likely to include the intervention topic as part of a session which involved obligatory topics than as a session in its own right.

**Impact of the intervention**

The target indicators used to assess the impact of the intervention were knowledge and practices associated with defecation of young children. Given the limited coverage of the intervention, analyses were also conducted to compare those exposed and not exposed to the intervention.

**Hygiene knowledge**

For the 69 out of 362 women in the intervention area who had received the pamphlet, we asked them what steps should be taken for successful potty training. A score of 0–5 was then allocated according to the adequacy of the response given. The mean score was 1.59 (range 0–5) and was associated with maternal education \((P = 0.08)\), ranging from 1.00 in the group with primary education or less through 1.43 in the group with incomplete secondary education, to 1.89 in the
group with secondary education or higher. Thus, not only was maternal education associated with the chance of being exposed to the intervention, but also with the retention of the messages promoted. The mean score was also higher in the community where implementation had been better, than in the remainder (2.00 versus 1.38, \( P = 0.05 \)).

During the questionnaire survey, all mothers were asked about the steps necessary for success in various child health/development outcomes, including potty training. No difference in responses was noted between the intervention and control groups. Within the intervention group, however, those who had been exposed to the intervention were more likely to describe ‘good features’ of successful potty training, as promoted in the pamphlet/video. This was especially true for the group who scored well when potty training knowledge was assessed in the structured observations (see above). The questionnaire was conducted 24–48 h prior to the structured observations and thus these results are encouraging, suggesting that mothers were not merely repeating the intervention messages when prompted directly.

**Hygiene practices**

At baseline, a total of 305 defecation episodes were observed in 273 children in the target age group (15–47 months) during the 4-h period. Post-intervention, the corresponding figures were 323 episodes in 290 children. Defecation ‘site’ varied markedly with age (Table III). There appeared to be an improvement in potty or toilet use between pre- and post-intervention, with a corresponding decrease in the use of open ground and, in the younger children (15–23 months, data not shown), of nappies/clothes. These changes, however, were witnessed in both the intervention and control areas, and thus cannot be ascribed to the intervention’s influence. When examination was made within the intervention group, children of those who scored well on the potty training steps were observed to have good practices more frequently, although with the small numbers involved this was not statistically significant.

Few changes were noted in hygiene practices associated with defecation, again where improvements over time appeared they occurred in both areas (e.g. whether feces were cleared safely from potties).

In the questionnaire survey, reported use of potties and/or toilets/latrines was similar in the intervention and control groups, and pre-post intervention. No difference in reporting was noted in the intervention area between those exposed and non-exposed to the intervention.

**Discussion**

Together with results from the formative research (Yeager et al., 1999), this intervention trial has added to our understanding of feces disposal practices, their determinants and potential for change. The shanty town community where the research was conducted is typical of many along the coastal region of Peru, and shares many characteristics of overcrowded and poorly resourced urban communities of other countries, such that our findings should have wider applicability. We found a range of existing practices, established facilitating factors and barriers to improvement, and used these to inform the design of a hygiene promotion strategy. The materials developed proved very popular with target audiences and those involved in delivery. Other aspects of the intervention’s implementation, e.g. the strategy employed for training the CRED staff in the content and use of the materials, were also well received. However, coverage by the intervention was a major problematic issue and we were unable to demonstrate an impact on the target behaviors.

We suggest several reasons for this coverage problem. Firstly, project funding was granted for the intervention to be delivered through the routine operations of the health services rather than in an ideal but non-replicable manner. Other intervention approaches, involving increased health facility resources, say, or community strategies such as peer counselors, were therefore precluded. We were thus testing not only a health communications intervention in its own right, but also its delivery mechanism (effectiveness rather than efficacy).

Table III. Comparison of hygiene behaviors related to defecation episodes (percent of episodes)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th>Baseline</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intervention</td>
<td>Control</td>
</tr>
<tr>
<td>No. episodes of defecation observed in children aged 15–47 months</td>
<td></td>
<td>140</td>
<td>165</td>
</tr>
<tr>
<td>Defecation site 15–47 months</td>
<td>nappy</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>clothes</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>potty</td>
<td>35</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>ground in or near home</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>toilet or latrine</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>distant open ground</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>When potty used, was it clean before use</td>
<td>yes</td>
<td>86</td>
<td>84</td>
</tr>
<tr>
<td>Child cleaned after defecation</td>
<td>yes</td>
<td>89</td>
<td>88</td>
</tr>
<tr>
<td>Child’s hands washed after defecation</td>
<td>yes</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Caretaker’s hands washed afterwards</td>
<td>yes</td>
<td>38</td>
<td>33</td>
</tr>
<tr>
<td>Potty cleaned before end of observation</td>
<td>yes</td>
<td>78</td>
<td>72</td>
</tr>
<tr>
<td>Feces either left in potty or not put in ‘safe’ place</td>
<td>yes</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>When child defecated on the home ground, feces cleared before end of observation</td>
<td>yes</td>
<td>27</td>
<td>34</td>
</tr>
</tbody>
</table>

The advantages and disadvantages of this approach are well known, and among the latter is the difficulty of introducing changes into these routine operations. Although we conducted some formative research with the CRED personnel, further motivational strategies to maximize their participation were, in hindsight, required. Furthermore, greater efforts to include other staff such as doctors (who were difficult to engage) and ancillary staff might have assisted. Other preparatory work such as task analysis observations might have been a helpful step to inform implementation design. Secondly, interventions delivered through this channel will only reach those sectors of a population reached by the health services. Although one might anticipate some ‘ripple effect’ from those reached by the health services to those not, such transmission takes time and could probably not be hoped for in the time frame of this project. Thus impact is only likely in the exposed group which, as in this case, will only constitute a certain proportion of the total target population. Thirdly, the implementation period was relatively short. A hygiene promotion intervention in Burkina Faso was implemented over 3 years and achieved greater success (Curtis et al., 2001).

We attempted to evaluate impact of the intervention on both knowledge and practices related to defecation, an approach advocated in the hygiene behavior field (Boot and Cairncross, 1993). Changes in behavior are challenging to accomplish and to demonstrate, and with the relatively low level of coverage achieved during the project period it was not surprising to find limited impact of the intervention. We believe the methods used to measure the target knowledge and behaviors were sufficiently robust, e.g. we used observed rather than reported behaviors. We also recognized the difficulties posed in assessing behaviors which vary within as well as between individuals (Cousens et al., 1996), basing the principal evaluation on community level rather than individual level assessment (Kirkwood et al., 1997). This was a challenging aspect of the evaluation, however, as it is for similar types of behavior measurement (Graeff et al., 1993). The changes noted in community characteristics and in hygiene practices reinforced the importance of having data from both an intervention and a control group, and from pre and post the intervention (Smith and Morrow, 1991). Our findings also emphasize the importance of collecting data on input and process indicators.
(Thorogood and Coombes, 2000), without this information we would have been unable to explain the lack of impact on behavior outcomes.

Nevertheless there were sufficient positive features to suggest that with higher coverage and/or more time for take up, an impact on target behaviors might have been achieved. Firstly, our monitoring data suggested that the hygiene messages were promoted more intensively in one of the intervention communities. The quantitative results on coverage showed that a higher proportion of mothers in this community were exposed to the intervention and that they had better knowledge of the potty training steps. Both health center attendance and maternal education were similar in all four communities and do not account for the exposure differences seen. Secondly, the structured observations suggested that children of mothers who scored well on the potty training steps were more likely to use a hygienic defecation site. The numbers are small, however, and statistical significance was not demonstrated.

It is useful to consider how greater coverage of the intervention, and thus potentially impact, might have been achieved. Clearly, an efficacy trial where the intervention was delivered in an intensive manner would be one alternative and this would test the health communications package itself without the testing of the delivery mechanism. However, if the intervention was successful under these conditions, then the question would remain as to whether it could be implemented in routine practice. With the approach adopted in the present study, an important issue was the availability of the nurses’ time and it is inevitable that not every consultation in CRED will provide opportunity to discuss hygiene issues. Nevertheless, we concluded that more efficient use could be made of the consultation time. It was also apparent that non-mandatory activities were given less attention by staff and although the intervention was given the full support by the MoH, it was not an activity on which CRED staff were evaluated, and we thus depended on the goodwill and enthusiasm of the staff. Naturally these varied between individuals. It is plausible that if the MoH had decreed that hygiene promotion were part of CRED’s mandatory tasks on which they would be evaluated, then greater coverage might have been achieved. It would not have been straightforward for the MoH to do this with an unknown intervention, however. The question of how to implement efficacious interventions in routine circumstances is a topical and challenging one. In child health, however, so much is now known about interventions for the major causes of childhood morbidity and mortality, that tackling the issue of their implementation in health services must be a priority. A particular need is wider publication of the design and implementation of interventions, not only their impact, to help us understand better their successes and failures.

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**References**


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