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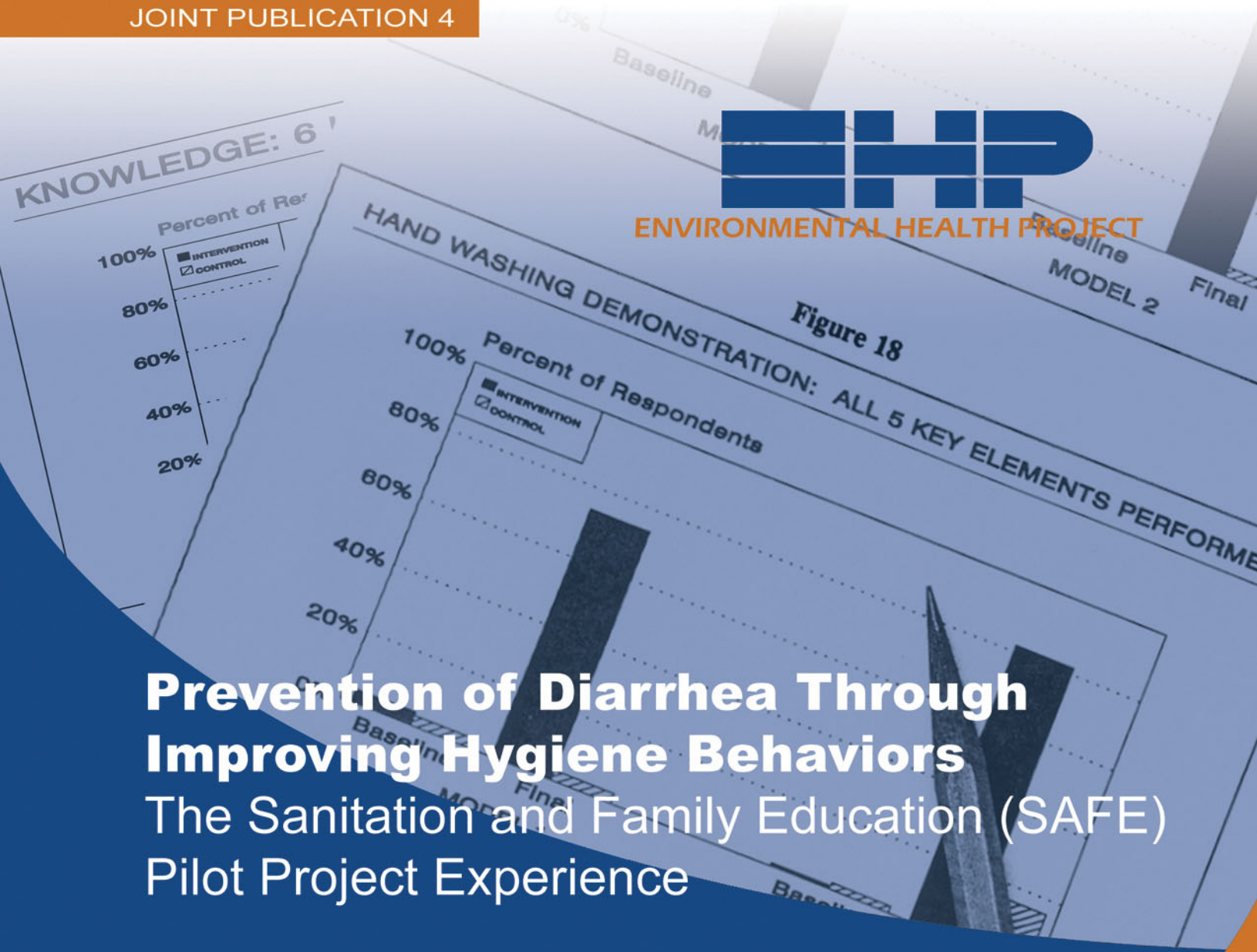

ENVIRONMENTAL HEALTH PROJECT

Prevention of Diarrhea Through Improving Hygiene Behaviors

The Sanitation and Family Education (SAFE) Pilot Project Experience

O. Massee Bateman, Raquiba A. Jahan,
Sumana Brahman, Sushila Zeitlyn, and Sandra L. Laston

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ENVIRONMENTAL HEALTH PROJECT

ICDDR,B CENTRE FOR HEALTH AND POPULATION RESEARCH

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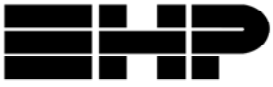
A CARE–ICDDR,B–EHP Joint Publication



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ACRONYMS AND ABBREVIATIONS

CT	Tubewell Caretaker
DPHE	Department of Public Health Engineering, Government of Bangladesh
ICDDR,B	International Center for Diarrhoeal Disease Research, Bangladesh
KCP	Key Community Person, identified as a key source of advice and information for community members
LGS	Labon Gur Solution, a home-made sugar-salt oral rehydration solution
ORS	Oral Rehydration Solution
SAFE	Sanitation and Family Education Project
TW	Tubewell
WASH/CARE	Water Sanitation and Hygiene Project (A CARE/Bangladesh project)

PREFACE TO THE 1995 REPRINT

This report is the product of collaboration between CARE Bangladesh and ICDDR,B. CARE conceived and implemented the SAFE Pilot Project, and ICDDR,B provided technical assistance in anthropology and epidemiology. Five reports on the project were published by CARE Bangladesh, providing a detailed account of the SAFE experience. This report was originally published by CARE in February 1995 with the title "Sanitation and Family Education (SAFE) Pilot Project: Report on the Final Surveys." It provides a summary of much of the work done in the project, presents the "SAFE approach," and evaluates the intervention. Recognizing that the topic and findings are of interest to a wide audience, particularly those with interests in diarrhea prevention and behavior change interventions, ICDDR,B is reprinting the original CARE report as a part of the Special Publication Series.

PREFACE TO THE 2002 REPRINT

CARE Bangladesh, with technical assistance from the International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B), developed and implemented the and Sanitation Family Education (SAFE) Project as a follow-on activity to CARE's Water and Sanitation/Hygiene Project (WASH/CARE). WASH/CARE focused primarily on "hardware" rehabilitation and installation, whereas the SAFE Project focused on the "software" aspects of water, sanitation, and hygiene—particularly, hygiene promotion.

The principal document that resulted from the SAFE Project was published by CARE Bangladesh in February 1995. CARE Bangladesh and ICDDR,B reprinted the report, under the title Prevention of Diarrhea through Improving Hygiene Behaviors: The Sanitation and Family Education (SAFE) Pilot Project Experience, in July 1995. Unfortunately, the report has not received the wide circulation that its findings and methodological documentation deserve. The report's conclusions are quite striking, well documented, and entirely supportive of the approach being taken under the Community-Based Environmental Sanitation and Hygiene (CESH) component of the Environmental Health Project (EHP) of the U.S. Agency for International Development (USAID).

EHP is reprinting the report as an CARE–ICDDR,B–EHP joint publication. The purpose of the re-publication is to facilitate widespread distribution outside of Bangladesh and to make the document available to USAID and, through USAID's Center for Development Information and Evaluation, to all the users of USAID information services.

EHP thanks the authors, ICDDR,B, and CARE Bangladesh for permission to republish and disseminate the significant findings of the SAFE experience. We would also like to specifically thank Dr. O. Massee Bateman for initiating this idea of republishing the document and facilitating contact with those involved in the original work.

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While many individuals contributed to this document, we would particularly like to thank the SAFE field extensionists and staff whose dedication and tireless efforts made this report possible. We would also like to thank the community members, teachers, key community persons, tubewell caretakers, and the children who participated in this project and helped develop, monitor, and evaluate the SAFE Pilot Project.

In addition, we would like to specifically acknowledge the contributions of those noted below.

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GLOSSARY

Hanging Latrine	Elevated latrine structure with an open area below allowing feces to fall into a pond, ditch, or on the ground. Hanging latrines are typically built around the edge of a pond or over a ditch.
Pit Latrine	A dug latrine with a 2-meter deep pit, a diameter of one and a half hands, a bamboo slab or squat area and a separate cover plate.
"Sanitary" Latrine	Similar to a pit latrine, but superior construction, often of brick and/or mortar, and with a larger pit.
Water Seal Latrine	Similar to a sanitary latrine, but with a goose neck water seal slab/squat plate. Also called a "pour-flush" latrine.
Hygienic Latrine	A latrine that effectively isolates feces from the environment, that is a "sanitary", water seal, or pit latrine. Hanging latrines are not considered to be hygienic latrines. "Sanitary", water seal, or pit latrines with openings in the pits that allow feces to drain out and contaminate the environment were classified as hanging latrines.
Fixed Defecation Site	A solution provided by community mothers as an alternative to open defecation by young children (3-5 years old); Consists of a shallow dug hole, two bricks and a stick.
Tubewell	A small diameter protected (sealed) well with a handpump attached.
Open Well	A larger diameter unprotected, shallow, dug well. A bucket or similar utensil is used to collect water from an open well.

EXECUTIVE SUMMARY

CARE Bangladesh, with technical assistance from ICDDR,B, developed and implemented the Sanitation and Family Education (SAFE) project as a follow on activity to CARE's Water and Sanitation/Hygiene (WASH/CARE) project. The WASH/CARE project was a cyclone relief project, implemented in the coastal belt of Chittagong following a devastating cyclone in April 1991. The objectives of the WASH/CARE project were primarily hardware rehabilitation and installation, including repair of damaged tubewell platforms, provision of tubewells, and latrine construction. SAFE is a pilot covering about 9,100 households and is focussed on the "software" aspects of water, sanitation, and hygiene. The objectives of the SAFE project are to develop effective and replicable hygiene education strategies to promote behavior change, to develop and assess different models for health and hygiene education outreach, and to design and implement a behavior-based monitoring system for the hygiene education program.

Features of the SAFE approach include the following:

① Hygiene education interventions are developed based on information collected in small qualitative and quantitative research activities, rather than depending on stock messages and materials. Interventions focus on reinforcing existing behaviors (where beneficial) or developing specific, appropriate alternatives to existing behaviors.

② An incremental approach to improving hygiene behaviors is used. Rather than promoting a large number of "perfect" hygiene behaviors, SAFE seeks to identify those behaviors most strongly associated with diarrhea in children and to target these priority behaviors with locally appropriate interventions.

③ A behavior-based monitoring and improvement system is used to identify problems and opportunities for improving the intervention, analyzing the problems and developing solutions with community members, and adjusting and improving SAFE activities continuously.

④ Participation of community members in every aspect of the project is emphasized. This includes program design, outreach activities, monitoring, problem identification and analysis, and evaluation.

In addition, in this pilot project two models of outreach were implemented and compared. One is a more conventional model and is based on courtyard education sessions with the tubewell caretakers, their spouses, and tubewell users (referred to as "Model 1"). The second - more innovative - model adds additional outreach activities: school programs, child to child activities, and activities with key influencers in the community (referred to as "Model 2"). The purpose of this comparison is to determine the benefit of a more intensive outreach program to influence hygiene behaviors.

Based on the findings of baseline surveys and qualitative studies, specific SAFE interventions were developed in the following areas: Clean Water, Latrine Use and Feces Disposal, Environmental Cleanliness, Hand Washing, Food Hygiene, and Diarrhea Management. The SAFE pilot project interventions evaluated here took place over a total of nine months, from August 1993 to April 1994. Outreach methodologies varied by target group, but included group discussion, demonstrations, participatory action learning exercises, flash card displays, folk songs, role playing, a comic story session, and games.

The specific objectives of the SAFE Final Surveys are:

① to evaluate the effects of the SAFE intervention to improve hygiene behaviors in all family members and to prevent diarrhea in children under five years of age;

② to compare and assess the relative effectiveness of the two outreach models: Model 1 (tubewell caretaker and user groups); and Model 2 (tubewell caretaker and user groups, school programs, child-to-child activities, and key community persons).

The overall objective of these evaluations and comparisons is to provide guidance and lessons learned for the wider application of the "SAFE approach."

The final surveys employed the same methodology as the baseline surveys. Two questionnaires were utilized, one a household survey instrument and the second a tubewell area survey instrument. The household questionnaire included information on socioeconomic status, diarrhea in children, hygiene behaviors, access to water and sanitation services, and diarrhea treatment knowledge and behavior. The tubewell area questionnaire included characteristics and training of the tubewell caretaker and observations of the condition of the tubewell and platform. The questionnaire included questions of knowledge and practice and included spot observations and demonstrations.

The final surveys were applied in the same four areas as were the baseline surveys: outreach Model 1 intervention and nearby control (comparison) areas, and outreach Model 2 intervention and nearby control areas. Samples were taken using a multistage cluster sampling methodology, with tubewell service areas comprising the clusters. Within each selected cluster, the household of the tubewell caretaker plus 5 households of tubewell users were surveyed. An additional survey was performed of the tubewell caretaker and tubewell area (1 per cluster). Thirty clusters were chosen in each of the four study areas, for a total of 720 household questionnaires and 120 tubewell area questionnaires in all.

The effects of the SAFE intervention were estimated by comparing final survey results in the intervention and control areas, within each of the two outreach models. Results are also presented graphically for comparison to the baseline findings. A summary score was developed to provide an overall indication of performance for all targeted behaviors. The two outreach models (Model 1 and Model 2) were compared using these summary scores.

Dramatic improvements were seen in all areas of intervention, for all targeted behaviors, and by all measures -- knowledge, reported behavior, demonstrated practices, and observations. In addition, an estimated two thirds reduction in diarrhea prevalence was seen in SAFE intervention areas. These results provide very strong evidence that the SAFE approach can be effective in improving hygiene behaviors and reducing the incidence of diarrhea in children.

In the summary score, which looked at overall differences in behavioral indicators, rather than differences in specific areas of behavior, Model 2 performed significantly better than Model 1. Even so, the difference between Model 1 SAFE Intervention and Model 1 Control areas is much greater than the difference between the Model 2 and Model 1 SAFE Intervention areas. Caretaker sessions alone (Model 1) are worthwhile and have important benefits. Model 1 is a very good intervention; Model 2 (with multiple channels of communication) is a better intervention, by these measures. The dramatic differences between intervention and control areas, together with the smaller differences between the two intervention areas, suggests that the key elements of a successful hygiene behavior change program may be those that are similar in both models.

Based on the SAFE experience, the following guidelines are recommended for community-based hygiene behavior change programs:

- Focus on the relationships between behavior, the environment, and health
- Focus on behaviors, rather than messages or hardware targets
- Base interventions on the local context (existing beliefs, norms, and practices)
- Focus on a few key behaviors rather than a large number of "perfect" behaviors
- Emphasize community participation in all aspects -- design, development of interventions, extension, monitoring, problem solving, etc.
- Emphasize the need for community-wide participation and community action to improve the environment and health for all community members
- Develop and implement a behavior-based monitoring and improvement system for refining the intervention. Identify and analyze problems, and develop realistic solutions with community members.

In addition, recommendations are provided on improving the SAFE interventions (Section 5.2.2, pages 66-67), selecting channels for communication (Section 5.2.3, page 68), and integrating hygiene behavior change with hardware programs (Section 5.2.4, pages 68-69). Also included are a number of recommendations for health and development programs in general (Section 5.3, pages 70-71), and issues requiring further development and/or study (Section 5.4, pages 72-73).

1. INTRODUCTION

1.1 Background of the Project

CARE Bangladesh, with technical assistance from ICDDR,B, developed and implemented the Sanitation and Family Education (SAFE) pilot project as a follow on activity to CARE's Water and Sanitation/Hygiene (WASH/CARE) project. The WASH/CARE project was a cyclone relief project, implemented in the coastal belt of Chittagong following a devastating cyclone which hit the area in April 1991. The objectives of the WASH/CARE project were primarily hardware rehabilitation and installation, including repair of damaged tubewell platforms, provision of tubewells, and latrine construction. There was also a limited hygiene education component. The SAFE project built on the WASH/CARE experience, and, working in the same areas where WASH/CARE previously installed hardware, focussed on the "software" aspects of water, sanitation, and hygiene.

The objectives of the SAFE pilot project are to develop effective and replicable hygiene education outreach strategies to promote behavior change, to develop and assess different models for health and hygiene education outreach, and to design and implement a behavior-based monitoring system for the hygiene education program.

1.2 Innovative Aspects of the SAFE Pilot Project

The SAFE project is innovative in several respects. First, the hygiene education messages and activities were developed based on information collected in small quantitative and qualitative research activities, rather than depending on stock education messages and materials. This information on current beliefs and practices was used for focussing and developing SAFE hygiene behavior interventions.

This strategic approach of developing SAFE hygiene education activities based on current beliefs and practices also implies an incremental approach to improving hygiene behaviors. Recognizing that a very large number of behaviors exists in any conceptual model of perfect hygiene behavior, SAFE concentrated on creating awareness of diarrhea transmission and prevention and focussed on a small number of high priority behaviors for intervention. Priority behaviors are those that were found to be most closely linked to diarrhea transmission and which are amenable to change in the short term. This approach is action oriented, with a program focus on behaviors that can be improved through better information and problem solving in the community and that are most likely to have an observable impact on health in the short term. This is expected to provide a basis for further improvements in behavior over the long term. These features of the SAFE approach are consistent with recent recommendations by the American Public Health Association for Health Promotion Programs in general and by the World Health Organization for the development and implementation of hygiene education programs (APHA Task Force, 1987; WHO, 1993).

Two models of outreach were compared in the SAFE pilot project. One is a more conventional model and is based on courtyard education sessions with the tubewell caretakers, their spouses, and tubewell users. The second, expanded model adds more outreach activities: school programs, child-to-child activities, and activities with key influencers in the community. The

purpose of this comparison is to determine the benefit of a more intensive outreach program to influence hygiene behaviors.

The SAFE project also included an innovative monitoring and evaluation component, with a behavior-based monitoring system within a system for continuous program improvement. Information on hygiene behaviors gathered at the beginning of the project was used for developing key indicators for behavioral monitoring, as well as to improve the initial design of the project.

1.3 Purpose and Organization of this Report

The purpose of this report is to present the main findings from the final quantitative surveys and, based on these findings, to evaluate the effects of the SAFE interventions. The relative effectiveness of two SAFE outreach models, one limited and one more comprehensive, will also be assessed. The objective of these evaluations and comparisons is to provide guidance and lessons learned for the wider application of the "SAFE approach." A second report, describing the final qualitative assessments has also been published (Laston, et al., 1995).

This report is directed primarily to an audience of generalists. While most directly meant to aid SAFE project staff in evaluation of the pilot project and the development of subsequent activities, it is also meant for others working in similar projects within CARE and other organizations. For those working in water, sanitation, and hygiene behavior change projects, this report presents a model and lessons learned. While this report focusses on a hygiene education project, the approach is applicable to any project where behavior change is the key objective. This report should be useful to policy makers, program planners and managers, and others interested in setting program priorities, designing culturally appropriate programs, developing monitoring systems, and designing pilot projects.

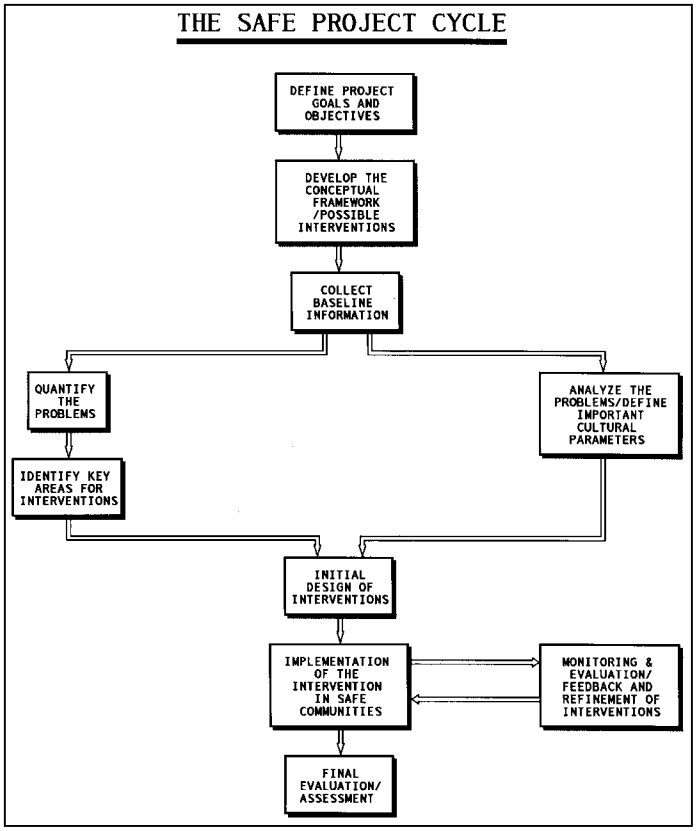
This report is organized into Introduction, Overview of the SAFE Pilot Project, Methodology, Results, and Conclusions and Recommendations. The Introduction section is meant to give the background to the SAFE Pilot Project and to introduce the purpose and organization of the Final Surveys and this report. The Overview of the SAFE Pilot Project provides a more detailed look at the SAFE project cycle and reviews the activities of the pilot project, including the results of the baseline surveys and a description of the interventions. The monitoring and improvement activities are also described in this section. The Methodology section provides details of the methodology used to develop the survey instrument, design and implement the survey, and to manage and analyze the data. This section also gives some details of the analysis strategy used to evaluate the SAFE interventions. The Results section presents the specific findings of the survey in detail. The Conclusions and Recommendations section provides a summary of the main conclusions and recommendations for SAFE and other community-based hygiene behavior change programs, as well as recommendations for health and development programs in general. A number of outstanding issues for further study and development are also noted in this last section.

2. OVERVIEW OF THE SAFE PILOT PROJECT

2.1 The SAFE Project Cycle

The SAFE Project Cycle is shown in Figure 1. As can be seen in the figure, once project goals and objectives were determined, a conceptual framework and outline of possible interventions was developed. The paradigm of fecal-oral transmission of diarrheal pathogens provides the conceptual framework within which specific interventions were developed in the SAFE project. The possibilities for behavioral interventions to interrupt fecal-oral transmission are numerous, perhaps hundreds of specific behaviors (Bateman, 1992). Recognizing this, baseline information was collected to provide information to identify key problems in hygiene behavior and identify key areas for interventions ("what"). In addition, baseline information collection helped analyze these problems and define important behavioral and cultural parameters ("why" and "how" questions). Complementary qualitative studies were the primary means to collect this information. In practice, the qualitative and quantitative information collection activities were not separate and sequential, but integrated into a cycle of information collection, analysis, and formulation of questions that require further information. Commonly this cycle alternated between quantitative and qualitative data collection.

Figure 1



Based on the analysis of baseline information, specific behavioral objectives were defined and intervention activities were developed. A monitoring system was developed that focussed on key indicators for these interventions. Information from the monitoring system was used for reviewing and refining the interventions when and where necessary. The final surveys are essentially a repetition of the baseline surveys, and the comparison of final and baseline surveys is intended to allow evaluation of the effects of the SAFE interventions.

2.2 Baseline Surveys and Findings

In order to support the overall objectives of the SAFE project, baseline surveys and qualitative assessments were conducted in April and May 1993 (Bateman, et al., 1993b, Zeitlyn, et al., 1994). The specific objectives of the SAFE Baseline Survey were:

① to gather information on the community and community members for documentation of existing knowledge, attitudes, and practices related to water, sanitation, and hygiene to assist in design of the hygiene education intervention;

② to assess the needs of the community for the planned interventions and for refining messages;

③ to gather information helpful to the development of a monitoring system and monitoring tools;

④ to provide a baseline for evaluation of the pilot project (i.e. to enable the comparison of evaluation indicators before and after the intervention to assess the relative effectiveness of the two models of outreach).

Two questionnaires were developed, one a household survey instrument (Baseline 1) and the second a tubewell area survey instrument (Baseline 2). The household questionnaire included information on socioeconomic status, diarrhea in children, water source, water gathering, water storage and handling, latrine access, latrine use, environmental cleanliness, hygiene knowledge and behavior - particularly Hand Washing behavior, and diarrhea treatment knowledge and behavior. The tubewell area questionnaire included characteristics and training of the tubewell caretaker and observations of the condition of the tubewell and platform. The questionnaire included questions of knowledge and practice and included spot observations and demonstrations. A systematic process of developing and pretesting the questionnaire, including several small qualitative studies, was employed.

Four areas were chosen for application of the baseline surveys: outreach Model 1 intervention and nearby comparison ("control") area, and outreach Model 2 intervention and nearby control area. Samples were taken using a multistage cluster sampling methodology, with tubewell service areas comprising the clusters. Within each selected cluster, the household of the tubewell caretaker plus 5 households of tubewell users were surveyed. An additional survey was performed of the tubewell caretaker and tubewell area (1 per cluster). Thirty clusters were chosen in each of the four study areas, for a total of 720 household questionnaires and 120 tubewell area questionnaires in all.

The baseline surveys were analyzed by examining the frequencies of events and responses, and by risk factor analysis. Risk factor analysis identified those factors currently present in the community, such as latrine use, hand washing at specific times, etc., most strongly associated with the occurrence of diarrhea in children. This risk factor analysis was used for identifying priority behaviors for intervention.

The results showed that diarrhea is common in children under 5 years of age in the surveyed areas and mothers have little understanding of the causes of diarrhea and its prevention. Several specific risk factors for diarrhea were identified. Based on these results, the following conclusions and recommendations were made:

Diarrhea Prevalence

- Diarrhea in children under 5 years of age is a major problem in the study areas, as in all areas of Bangladesh. At the peak of the diarrhea season - when this survey was performed - over 25% of households may have a child with diarrhea on any given day. Diarrhea may be seen as a routine part of daily life.

Recommendations for intervention and message development

  - Stress that prevention of diarrhea is possible, diarrhea does not have to be as common as it is now

Water: Access, Source Selection, Use, Handling, and Storage

- Access to tubewells is limited by distance, disrepair, and seasonal lack of water.

- Distance to the tubewell is less important than water handling and storage for the prevention of diarrhea.

- Pond water is commonly used for all purposes other than drinking, including cooking, washing utensils, and bathing.

- The highest water-related risks for diarrhea are drinking non-tubewell water and using open well water for any purpose.

- No increased risk of diarrhea was found to be associated with using pond water for non-drinking purposes. The combination of common use of pond water for non-drinking purposes and the lack of risk associated with using pond water for these purposes suggests that the common message of "Use tubewell water for all purposes" will be impractical, largely ignored in the community, and a low priority from a health protection point of view. Qualitative studies not reported here showed that community members find tubewell water inappropriate for cooking due to taste, color, and increased cooking time.

- Distance to the tubewell has a paradoxical (and strong) relationship with diarrhea prevalence. This appears to be related to water handling and storage practices, though the reasons for this require further investigation. Initial studies suggest that distance to the tubewell is a proxy for risk associated with poor tubewell water handling and storage practices, including: using the hands when drinking water, storage in an improper and/or uncovered container, and being casual in tubewell water collection and storage, with no one person in the household responsible.

- Water storage practices are generally good, with most households covering the stored water and using a narrow-necked container. Most households store both tubewell and pond water. Though not seen in this analysis, storing clean and unclean water may represent some risks related to mixing or misusing clean and unclean water.

Recommendations for intervention development

- Promote drinking only tubewell water
- Do not promote "Use tubewell water for all purposes"
- Identify and focus interventions on specific uses of pond water that increase the risk of diarrhea, such as adding pond water after cooking, or adding pond water to tubewell water for drinking
- Target open well water users, who are at high risk for diarrhea in their households. Open well water should be treated as highly contaminated water, like pond water
- Target water storage and handling behaviors, particularly keeping hands out of tubewell water, using a narrow-necked container to store tubewell water, keep stored water covered, and being systematic in the collection and storage of tubewell water

Areas requiring further investigation

- Specific uses of pond water that may increase diarrhea risk, particularly mixing pond water with food after cooking or with drinking water
- Water storage and handling behaviors
- Handling, storage, and use of open well water
- How those that live furthest from the tubewell handle and store tubewell and other water differently from those close to the tubewell
- How stored tubewell and stored pond water are kept separate.

Sanitation: Access to Latrines and Use

- Latrine access is high, but most latrines are not hygienic.
- Latrine use is high in older age groups, but falls off in children, particularly below 5 years of age.
- A fixed place for defecation may be a good option for small children.
- Latrine use is the key measure for diarrhea prevention; it is much more important than latrine access. The risk of diarrhea is related to the number of family members that usually use latrines, and to exclusive latrine use.
- Latrine use by children, particularly those under 5 years of age, is very dependent on type of latrine available, with unhygienic, more contaminated, and shared latrines less often used by small children than hygienic, clean, private latrines.
- There is a small risk associated with sharing a latrine with another household. This may be due to cross contamination and diarrhea transmission between households via fecal contamination in and around latrines.
- From an individual household point of view, any latrine is better than no latrine.
- From a community point of view, a high level of coverage with hygienic latrines appears to have modest health advantages, though this could not be well-evaluated here because of the very small number of communities with a high level of coverage with hygienic latrines in the areas studied. Nonetheless, this finding is considered to be important because it is consistent with the conceptual model of fecal-oral transmission of diarrhea - i.e. hygienic latrines keep fecal contamination out of the environment. It is also supported by similar findings from a study in Guatemala (Bateman and Smith, 1991).

Recommendations for intervention and message development

- Focus on latrine usage by all members of the family, all of the time. The use of any latrine, hygienic or unhygienic, is better than not using a latrine
- Explore the use of a fixed place for defecation by small children, develop viable options with the community. Examine barriers to latrine use by children
- The second priority after addressing latrine use is upgrading latrines from unhygienic to hygienic latrines.

Areas requiring further investigation

- Barriers to latrine use by small children; special characteristics of families where small children use latrines
- Possibilities for promoting the use of a fixed defecation place for small children, How such a space may be developed, what will be necessary (e.g. two bricks), how feces will be removed hygienically
- Special characteristics of households with pit latrines/why some families installed pit latrines.

Environmental Cleanliness and Contamination

- The household environment and latrines are highly contaminated with observable feces; microbiological contamination can be expected to be everywhere.
- The most important intervention to decrease fecal contamination of the yard is latrine use.
- Latrine type is related to latrine cleanliness (hanging latrines are the most contaminated).
- Contamination inside and around latrines is an important risk factor for diarrhea. This may be a special problem for shared latrines.

Recommendations for intervention and message development

- Focus interventions on those that prevent contamination of food and water close to the time of ingestion, since the environment is highly contaminated and even clean food and water is likely to be contaminated by the "delivery system"
- Focus on latrine use by all family members, all of the time. Any latrine is better than no latrine
- Focus on latrine cleanliness, especially for shared latrines
- Secondarily, promote upgrading latrines from hanging latrines to hygienic latrines.

Knowledge of Diarrhea Causes and Prevention

- Knowledge of causes of diarrhea is poor, and is a risk factor for diarrhea.
- Knowledge of poor hand washing practices as a cause of diarrhea is particularly important and most strongly associated with the risk of diarrhea.
- Knowledge of diarrhea prevention is even less than knowledge of causes.
- Reliance on traditional interpretations of diarrhea causation is a risk factor for diarrhea, especially when exclusively relied on.

Recommendations for intervention and message development

- Improve knowledge of diarrhea causes and prevention, focus on knowledge of good hand washing behaviors as first priority
- Focus on improving understanding that diarrhea can be prevented, and the community may act to do so
- Target mothers who rely exclusively on traditional explanations of diarrhea causality. Seek to add knowledge of correct causes to traditional beliefs. Avoid competition between traditional explanations and modern explanations of diarrhea causation and prevention.

Hand Washing Practices

- Knowledge of critical times to wash hands is poor.
- Those hand washing times with the strongest association with diarrhea are close to the time of eating or related to handling children's stools.
- There is no “magic bullet” for hand washing, a variety of hand washing times are important.
- Hand washing before prayer was not found to be associated with decreased risk of diarrhea. This is most likely explained by ritualistic hand washing before prayer rather than effective hand washing techniques.
- Hand washing technique is weak (infrequently demonstrated) in the areas of using a cleaning substance (ash, soap, mud) and drying the hands hygienically. These are also the areas with the strongest association with diarrhea.

Recommendations for intervention and message development

- Focus on hand washing times and techniques
- Priority hand washing times to focus on include before eating, before serving food, before feeding the child, and after handling the child's feces or cleaning the child's bottom. Hand washing after defecation should also be reinforced
- Critical hand washing techniques to focus on include using a cleaning substance (soap, ash, or mud) and drying the hands hygienically after washing
- Stress the need to wash the hands several times a day
- Promote hand washing sites to facilitate hand washing at priority times; possibilities include near the latrine, near the kitchen/eating area, near the tubewell site.

Areas requiring further investigation

- Obstacles to hand washing and where a practical hand washing site may be promoted, e.g. near the kitchen.

Characteristics of the Tubewell Caretakers and Tubewell Areas

- Caretakers are underprepared for their tasks, without wrenches and training in the majority of cases.
- There is a high turnover of caretakers, with only 50% of the original caretakers currently performing the role. This indicates that caretakers not only need initial training and preparation, but followup training is necessary particularly to target the "new" caretakers as responsibility is passed from the original caretaker to a new person.
- Hand washing sites are not available near the tubewells.
- Tubewell platforms are commonly soiled with garbage and feces.
- Tubewells frequently are not functioning properly - one out of ten in this survey which was biased towards functioning tubewells.

Recommendations for intervention and message development

- Identify how the caretakers can obtain wrenches and training in their use and give this information to the caretakers
- Investigate the possibility of hand washing sites near the tubewells.

Areas requiring further investigation

- Frequency and determinants of caretaker turnover, the average time spent in the caretaker role.
- Determinants of tubewells not functioning (caretakers characteristics and preparation, community and tubewell user characteristics, geographical characteristics)

Other Prevention Measures

- Breastfeeding, particularly exclusive breastfeeding for the first 4 to 6 months of life is a well established means of decreasing the risk of diarrhea in infants, as well as having other health benefits. Breastfeeding was not examined as a risk factor for diarrhea in this study, but should be included in the SAFE prevention strategy.

Recommendations for intervention and message development

- Promote maintaining the cleanliness of food as a means to prevent diarrhea, and breastmilk as the cleanest and best food for infants
- Promote exclusive breastfeeding until 4 to 6 months of age. Include messages that supplementing breastmilk during this period can introduce contamination and cause diarrhea, even if the main food source is breastmilk.

Diarrhea Treatment

- Knowledge of LGS/ORS and continued feeding and breastfeeding during diarrhea is generally good, but there is room for improvement.
- Knowledge of the purpose of LGS/ORS and how to mix it correctly is poor. This suggests that the use of ORS in the home is mostly ineffective, though frequently attempted.

Recommendations for intervention and message development

- Focus on LGS/ORS use, how to mix it properly, how much/how often to give it and how long to continue giving it
- Focus on the purpose of ORS to help stress the need for continued use and adequate quantities of ORS
- Continue routine messages of using ORS, continued feeding, continued breastfeeding. Assure that the messages are recognized as similar to those that are being received from other sources.

2.3 Initial Qualitative Assessments and Findings

Initial qualitative studies were done to help define the questions, terminology, and response categories for the Baseline Survey instrument; to help further define the problems and devise appropriate interventions, and to answer questions raised by the results of the Baseline Survey, and to identify key influential persons in the community. The qualitative methods that were used included Key Informant Interviews, Semi-Structured Interviews, Group Interviews, Focus Group Discussions, Observations, and Participatory Rural Appraisal. In most cases, different methods were applied to help distinguish between actual behaviors and ideal behaviors. These studies are presented in more detail in the Report on the Qualitative Assessments (Zeitlyn, Brahman, et al., 1994); examples of results and main recommendations are reviewed here.

2.3.1 Defining Questions, Terminology, and Response Categories for the Baseline Survey Instrument

Water Collection, Water Quality, and Water Storage

Our assessments showed that women collected and used both tubewell and pond water. The pond water was used for cooking. They also provided information on water storage practices. We also learnt about community perceptions on the advantages and disadvantages of tubewell and pond water. This information helped us to better structure and organize the baseline survey instrument. The focus groups helped to reveal the ideal behaviors, while the observations and interviews helped us identify constraints and understand the extent to which ideals are actually practiced in the community.

Disposal of Infants' Feces and Causes and Prevention of Diarrhea

Observations in households with children under two years of age gave us information on how and where infant feces were disposed of. We conducted a number of interviews with mothers and focus group discussions with tubewell caretakers, teachers, and children on this subject. Also, through a combination of focus groups and semi-structured interviews with mothers and tubewell caretakers, we found out what they believed to be the cause of diarrhea. These methods enabled us to gather important information on common beliefs and practices, and helped us to accurately pre-code the questionnaire.

2.3.2 Defining the Problem and Devising Appropriate Interventions

Hand Washing

Several CARE field extensionists and tubewell caretakers pre-tested some intervention messages on hand washing. Since ash and mud are both potential low-cost alternatives to soap, we asked them to clean their hands using either ash or mud (depending on their preference) for one week. They described the advantages and disadvantages of each agent, and the practical ways they had adapted and modified the advice for use. This gave us direct feedback on how the agents were perceived. For instance, we learnt that mud was associated with "worms and germs," while ash was seen as relatively "cleaner."

We observed that hands are often dried in an unhygienic way after washing which can increase the pathogenic contamination. Through a focus group discussion with mothers, we found that it would be feasible to promote the idea of keeping a special clean rag for hand drying. The message would include advice to frequently wash the rag.

Disposal of Young Children's Feces

We interviewed tubewell caretakers, mothers, field extensionists, school children and teachers to further explore how feces were disposed, latrine use by young children, and effective and acceptable alternative strategies. From this information, we defined messages on latrine use which were promoted in schools and the community.

Using Field Workers as Key Informants

The SAFE extensionists come from the communities in which they work. We recognized the value of their local knowledge, and encouraged them to analyze, and to relate their own observations and experiences to the process of intervention development. This gave them a sense of partnership in the investigation and implementation process. They were also aware of the rationale for the data gathering activities and played an active part in developing and testing hypotheses and interpreting the findings. As key informants they gave us valuable information, and also helped relate to the messages in a more practical way.

2.3.3 Answering Questions Raised by the Baseline Survey

Why do those living furthest from the tubewell have less diarrhea?

We found a paradoxical relationship in the baseline survey between distance to the tubewell and rates of diarrhea in the household. The 56 households 20 minutes or more away from the tubewell experienced less diarrhea than those that were closer to the tubewell. Observations and a small survey explored why this was the case. Findings showed that in general, those who lived close to the tubewell were less careful and more careless about water storage. Also, they were more likely to prime the tubewell with pond water when it was running dry or not pumping well. These findings were important for intervention development.

Why do some households have a pit latrine?

Our baseline survey showed that a small group of six households had built and used their own pit latrine. We asked ourselves why these few households had taken the unusual step of constructing a home-made pit latrine. Through focus group discussions and key informant interviews, we learnt about the perceived advantages and disadvantages of pit latrines, and how they compared to the more popular hanging latrine. Pit latrines were perceived to reduce unpleasant odors and contamination of the household environment. These findings were incorporated into the promotional messages.

2.3.4 Recommendations for the SAFE Project

- ✦ Qualitative methods have an important part to play in the monitoring and evaluation of the SAFE project. Some can capture ideal behaviors, while others are better at identifying actual behaviors.

- ✦ A few weeks after message dissemination, observations of behavior around tubewells, ponds, and latrines, followed by focus group discussions should be conducted to see if people recall messages, and also evaluate how messages have been understood. This could also provide feedback from the audience on the quality of the outreach sessions.

- ✦ Qualitative approaches can show if beneficiaries perceive that changes are happening, and can tell us how people respond to the changes. Community mapping can be used for assessing changes in a sub-sample of the communities. This kind of information would help assess the community's perception of the effectiveness of the project's strategies.

- ✦ Focus groups with field extensionists and beneficiaries could help evaluate the process of message dissemination, and identify areas for improvement.

- ✦ The role of the "key community person" should be evaluated. For those felt to be particularly effective, small case studies could be prepared. Their role and activities should be described and documented to identify the problems and strengths of this approach.

- ✦ When problem areas are identified, a mini "workshop" might be conducted to focus on these problems and find solutions. This could involve key people, such as tubewell caretakers, effective "key community persons," and mothers. After working in small groups moderated by field extensionist or their supervisors, a plenary session could bring together recommendations for solving the problems. This could also increase the momentum among workers and beneficiaries to find solutions.

2.4 SAFE Interventions

2.4.1 Intervention Development

Intervention content and extension methodology were developed in the SAFE Pilot Project based on the paradigm of fecal-oral transmission of diarrhea and baseline information from the intervention areas, including findings from both the baseline surveys and qualitative studies. The interventions were further refined based on dialogue with community members and information from monitoring surveys. The general principles used for intervention development are shown in table 1.

Table 1

PRINCIPLES FOR SAFE INTERVENTION DEVELOPMENT

1. Interventions focus on diarrhea prevention
2. Interventions are consistent with the conceptual model of fecal-oral transmission of diarrhea
3. Interventions are based on the local context (qualitative and quantitative assessments) and focus on those behaviors most strongly associated with diarrhea in children
4. Interventions focus on a small number of key behaviors, rather than a large number of perfect behaviors. Interventions emphasize behavior change, rather than message delivery and memorization
5. Interventions stress the relationship between behavior change and improved health
6. Interventions focus on reinforcing existing behaviors (where beneficial) or developing specific, appropriate alternatives to existing behaviors
7. Intervention development, both messages and materials, is participatory - that is, in partnership with community members
8. No standardized materials or messages developed for other populations are used
9. Extension methodologies are participatory rather than didactic
10. Interventions emphasize the need for community-wide participation and community action to improve the health and environment of all community members
11. Information from monitoring surveys focuses on targeted behaviors and is used for evaluating and identifign problems with SAFE interventions
12. Based on monitoring activities, interventions continuously evolve and are further refined through dialogue with the community

2.4.2 Priority Behaviors for Intervention

Based on baseline information (see sections 2.2 and 2.3), priority behaviors for intervention were identified in 6 areas: clean water, latrine use and feces disposal, environmental cleanliness, hand washing, food hygiene, and diarrhea management. The interventions were developed and refined to address specific behaviors (see section 2.4.1). In this respect the SAFE interventions were behavior-focussed rather than message-focussed. Specific behavioral objectives of the SAFE project are shown in table 2a-2c.

Table 2a

BEHAVIORAL OBJECTIVES

1. Clean Water

- Only tubewell water is used for drinking
- Tubewell water is kept pure by:
  - not mixing pond water with tubewell water for drinking
  - not using pond water to prime the tubewell
- Stored drinking water is kept clean in the following ways:
  - drinking water is stored in a Kolshi
  - the Kolshi is kept covered with a lid
  - the lid is kept clean
  - the Kolshi is kept clean
  - hands are kept out of contact with drinking water

2. Latrine Use and Feces Disposal

- All family members > 5 years of age defecate in a hygienic latrine
- Young children (3-5 years) defecate in a latrine or fixed place
- Children's feces are disposed of hygienically

Table 2b

BEHAVIORAL OBJECTIVES

3. Environmental Cleanliness

- Latrine is maintained clean (inside and outside) - especially shared latrines
- Yard is kept clean and free of human feces (and garbage)
- All community members defecate in a hygienic latrine

4. Hand Washing

- Hands are washed with ash/soap before:
  - Eating
  - Feeding children
  - Food serving/handling
- Hands are washed with ash/soap/mud after:
  - Defecation
  - Feces disposal or any contact with any human feces
  - Washing the child's bottom after defecation
- Hand washing technique includes all 5 of the following:
  - Uses water
  - Washes both hands
  - Uses ash, soap, or mud
  - Rubs hands at least three times
  - Hands are dried hygienically -- by air drying or using a clean rag
- Mud/ash/soap is kept near the kitchen (or other convenient place) for hand washing
- The rag used for hand drying is:
  - kept exclusively for hand drying
  - cleaned daily

Table 2c

BEHAVIORAL OBJECTIVES

5. Food Hygiene

- Food is kept covered
- Infants less than 6 months of age are exclusively breastfed
- Pond water is not added to food after cooking

6. Diarrhea Management

- ORS/LGS is given to treat diarrhea
- Correct ingredients and quantities are used for preparing LGS
- Breastfeeding is continued during diarrhea
- Normal feeding is continued during diarrhea

2.4.3 Knowledge Objectives

The focus of the SAFE Pilot Project is behavior change. Knowledge objectives generally are designed to support the specific behavioral objectives. For example, knowledge of why ORS/LGS is used to treat diarrhea is a support to increase ORS/LGS use during diarrhea. Knowledge of the difference between a hygienic and an unhygienic latrine, and knowledge of how to construct a hygienic latrine, are supports for the behavioral objective of all family members using a hygienic latrine. To provide a basis for understanding the importance of specific behaviors in the prevention of diarrhea, the role of fecal contamination in diarrhea transmission was presented as a "Diarrhea-Contamination Cycle." The meaning of this conceptual cycle was elaborated by community members based on their experiences and observations, for example including observations about how pond water may become contaminated with feces and the various means by which contaminated pond water may be ingested by community members. The elaborated diarrhea-contamination cycle then provided a basis for understanding and discussing the importance of specific behaviors in diarrhea transmission.

2.4.4 Hardware Objectives

Though common in water and sanitation-related projects, the SAFE Pilot Project had no hardware targets or goals. The SAFE model focussed on behavioral change, with community norms, physical services (hardware), and knowledge supporting appropriate hygiene behaviors. Sharing information on low-cost latrine design, local availability, and how to build a latrine (including demonstrations) was included in Round 3 of the intervention (see below: Table 5 and Section 2.6).

2.4.5 Extension Models and Methodology

Two different models of extension were used in the SAFE Pilot Project. Model 1 was more limited and conventional, working only through caretaker sessions. Model 2 was an expanded model, involving, in addition to sessions with caretakers, school sessions, child-to-child sessions for non-school children, and key community persons. The interventions were implemented by Field Extensionists (FEs, SAFE Project staff). There were a total of 13 FEs, 6 in the Model 1 area and 7 in the Model 2 area. All FEs had completed secondary education and had one year of experience in community work prior to SAFE (in the WASH/CARE project). Eleven of the FEs were women, two were men (one in the Model 1 area and one in the Model 2 area).

The role of the FEs was primarily to facilitate discussion during the sessions, providing technical input when required. In the example described above, the FE initiated a discussion on fecal contamination in the community, then reviewed with participants the picture of the community illustrating how feces may contaminate the environment and be spread from person to person. The FE would then facilitate a discussion among community members focussing on what actions can be taken to avoid this threat to their health and their community's beauty. The two models are summarized in Table 3.

Table 3

TARGET GROUPS: MODEL 1 vs. MODEL 2

MODEL 1[1]

Activity	Target Group	Frequency
Caretaker Sessions	Women	2 sessions/month/ caretaker area
Male Sessions	Men	1 sessions/month/ caretaker area

MODEL 2[2]

Activity	Target Group	Frequency
Caretaker Sessions	Women	2 sessions/month/ caretaker area
Male Sessions	Men	1 session/month/ caretaker area
Primary School Sessions	School-going Children 7 to 10 years of age	2 sessions/month/ school
High School Sessions	School-going Children 11 to 15 years of age	2 sessions/month/ school
Child-to-Child Sessions	Non-school Children 5 to 15 years of age	2 sessions/month/ area surrounding primary school
Key Community Persons	1. Key Influential Persons (directly) 2. Entire Community (indirectly)	1 spot discussion session/month

[1] Model 1 Ratio of FEs to Caretaker Areas - 1 to 30

[2] Model 2 Ratio of FEs to Caretaker Areas - 1 to 12;
this also give ratios of 1 FE to 7 KCPs and 1 FE to 1.6 Schools

Extension methodologies used by type of session are summarized in table 4.

Table 4

EXTENSION METHODOLOGIES BY TYPE OF SESSION

Caretaker Sessions

- Group Discussion
- Demonstration
- Flash Card Display
- Folk Songs
- Participatory Action Learning (PAL) Exercises

Male Sessions

- Group Discussion
- Demonstration
- Flash Card Display
- Folk Songs
- Participatory Action Learning (PAL) Exercises

School Sessions

- Group Discussion
- Role Playing
- Comic Story Session
- Flash Card Display

Child-to-Child Sessions

- Group Discussion
- Role Playing
- Comic Story Session
- Flash Card Display
- Games
- Folk Song

Key Community Persons

- Spot Discussion
- Questions and Answers
- Flash Card Display

Extension activities were conducted in three rounds (one per month). Each round was repeated 3 times over the nine-month intervention period. The rounds are described in Table 5.

Table 5

INTERVENTION ROUNDS

ROUND 1: DIARRHEA PREVENTION AND MANAGEMENT

Areas Covered:

- ✦ Clean Water (Source Selection, Collection, Handling, Storage)
- ✦ Latrine Use and Feces Disposal
- ✦ Environmental Cleanliness
- ✦ Hand Washing
- ✦ Food Hygiene
- ✦ Diarrhea Management

ROUND 2: SAFE WATER

Areas Covered:

- ✦ Review of Previous Round
- ✦ Clean Water

ROUND 3: SANITATION AND HYGIENE

Areas Covered:

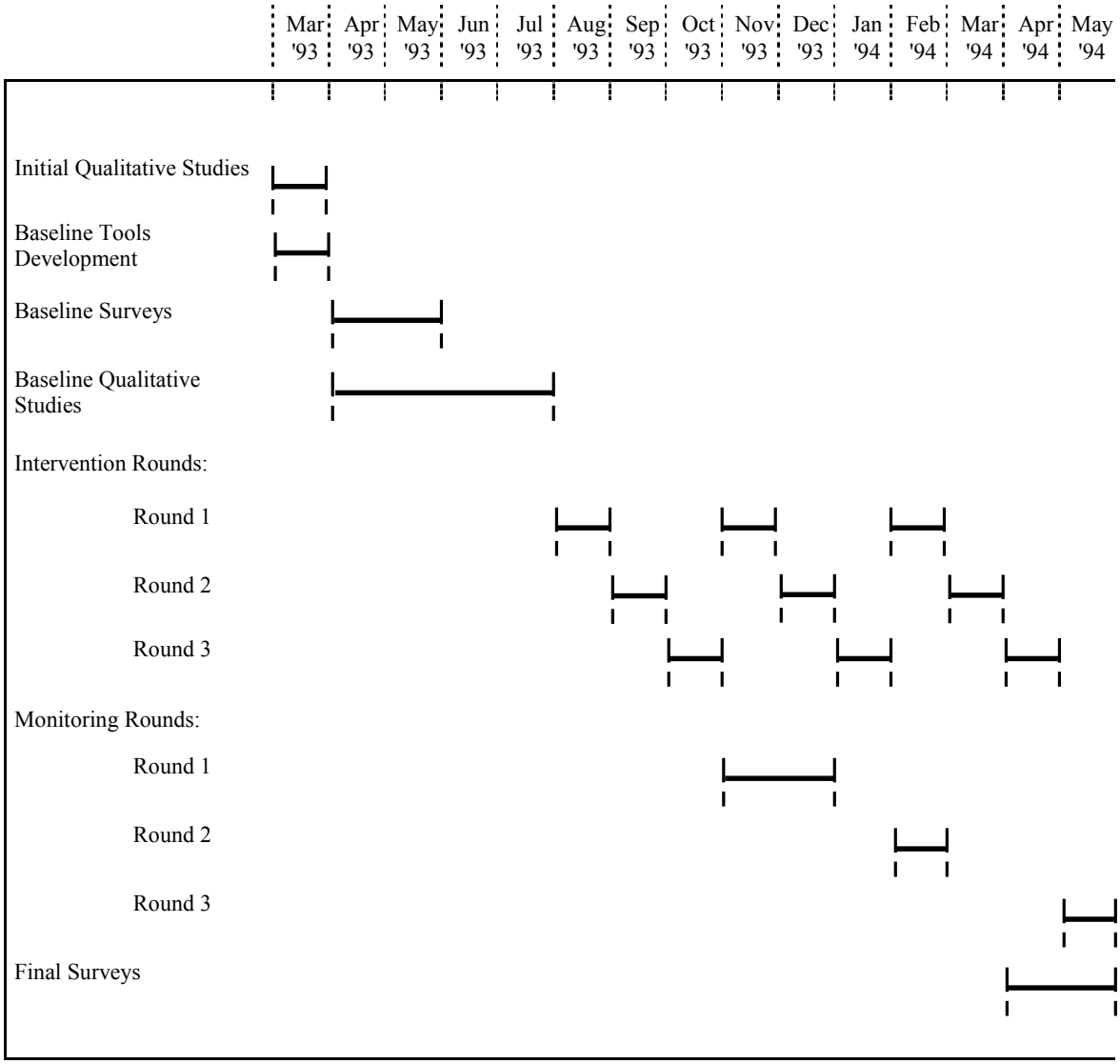
- ✦ Review of Previous Round
- ✦ Latrine Use and Feces Disposal
- ✦ Environmental Cleanliness
- ✦ Hand Washing

2.5 SAFE Monitoring, Evaluation, and Program Improvement Strategy

The interventions initially developed based on baseline findings were revised and refined throughout the intervention period. A monitoring system was established to assess key behavioral and knowledge indicators on a 3-monthly basis. The findings from each monitoring cycle were reviewed in group sessions with the SAFE staff, as well as in sessions with SAFE field extensionists and community members. Problem areas were defined and refinements of interventions and extension strategies were discussed and developed. For example, initially the use of "fixed places" for defecation by children under 5 years of age was recommended, based on baseline findings. This intervention was refined through discussion with the community to specify the use of two bricks (for the feet) and a stick (for the child to hold). On subsequent monitoring a problem was identified with this intervention: the fixed places were soiled with feces and feces were not being removed from fixed places for hygienic disposal. The solution developed, again through discussions with community members, was to improve the fixed places by digging a small hole, a sort of small pit latrine, where feces could be covered. Other mothers sought to more quickly "graduate" their children from a fixed place to latrine use.

2.6 Timeline and Intervention Summary

Figure 2



3. METHODOLOGY

3.1 Description of the Project Area and Overview

The project area is located in a coastal area near Chittagong in southeastern Bangladesh. Chaturi union of Anwara thana and Saidpur union of Sitakunda thana were chosen as the project areas. Chaturi union has a total of 8 villages, each with an average size of 1,805 households. Saidpur union has a total of 9 villages, each with an average size of 2,465 households. The major occupation of the villagers is agriculture with very few engaged in business or service. The majority of the population is Muslim, although there are some Hindus and Buddhists.

In order to make a valid estimate of the effect of each of the two SAFE intervention models, each model intervention area had a nearby comparison area (the control area). The purpose of the control areas was to provide a control for trends in hygiene behavior change unrelated to the SAFE intervention, such as influence of the national latrine promotion program. Information was collected in the control areas in both baseline and final surveys. Therefore, both baseline and final surveys were conducted in 4 areas:

Table 6

Area	Thana, Union	Population	No. of Tubewells
Model 1, Intervention	Sitakunda, Saidpur	22,153	263
Model 1, Control	Sitakunda, Bariyadala	19,228	223
Model 2, Intervention	Anwara, Chaturi	14,443	129
Model 2, Control	Anwara, Paraikora	19,077	133

3.2 Questionnaire Development

The questionnaire used in the final survey was based on the baseline survey questionnaire. Exact wording of questions and instructions to interviewers were maintained in the final survey. Additional questions were added, primarily to collect information on specific interventions that were developed after the baseline survey.

The questionnaire was revised into final form through review and pre-testing. The principles of revision of the questionnaire were the same as in the baseline. The areas covered in the final survey were also the same as in the Baseline Survey (see Bateman, et al., 1993b).

3.3 Sample Design

The sample size was calculated using standard methods to be able to detect an improvement of at least 20% of total responses in an evaluation indicator when comparing either baseline and final surveys in one area or intervention and control areas. The sample size calculation criteria were a power of .90 (90% chance of finding a true difference of 20% between baseline and final surveys) and a Type 1 error of .05 (5% chance of finding a difference when in fact none exists). The sample size was determined to be approximately 150 households for each of the 4 study areas, or a total of 600 households in all 4 areas (model 1 intervention and control areas, model 2 intervention and control areas). This sample size also gives a precision of about +/- 8% (that is, 95% Confidence Limits) for point estimates in the survey for each area (150 households).

A multi-stage cluster sample technique was used for selecting households for the survey. Clusters were defined as tubewell catchment areas, that is all of the households that use a specified tubewell. A list of tubewells, tubewell caretakers, and number of user households for each tubewell was obtained from the DPHE, a local NGO, and WASH/CARE records and checked and revised in the field by the SAFE project staff. The number of user households per tubewell ranged from 6 to 40 (those with less than 6 households were excluded). The sample design was 30 clusters with 5 households per cluster, plus the household of the tubewell caretaker in each cluster, for a total of 6 per cluster and 180 per study cell; a total of 720 households in the four cells. The relatively large number of clusters (30) and smaller number of households per cluster (5+1) was chosen to decrease design effect, that is the clustering of characteristics to be surveyed, since it was believed that the characteristics of interest may vary greatly from community to community.

The sample was taken by listing and numbering consecutively all of the tubewell areas in one cell and then randomly choosing 30. In some cases, selected clusters were replaced when there were insufficient households meeting selection criteria in the cluster, or where there was more than one tubewell close to the home, and a group of households exclusively using one tubewell could not be defined.

Systematic second stage sampling was done in the field at the time of the survey. The caretaker's household was interviewed first. Users of this specific tubewell were determined by asking the tubewell caretaker. The field worker next chose the household living furthest from the tubewell, but exclusively using the tubewell. The remaining 4 households were selected by proceeding towards the right of that house and choosing each household until a total of 5 households had been interviewed in the cluster (in addition to the caretaker's house). In addition to the household survey, the tubewell area survey was applied by questioning the caretaker and inspecting the tubewell and surrounding area. One of these surveys was performed per cluster for a total of 120 questionnaires.

Selection criteria for the survey of user households as follows:

- The household uses no tubewell other than the identified tubewell for the selected cluster.
- There was at least one child less than 5 years (60 months) of age living in the household at the time of the survey.

3.4 Application of the Questionnaire

As described above, the household questionnaire was applied in 6 households in each selected cluster, that is the caretaker's household (respondent=caretaker or spouse) and 5 tubewell user households (respondent=mother). Of the 720 respondents, 717 were women and three were men. In addition, one tubewell survey was applied by questioning the caretaker an observation of the tubewell and surrounding area. The questionnaire was applied by 12 fieldworkers and 6 supervisors. All fieldworkers were trained and provided with a detailed field instruction manual. The six supervisors managed quality control during data collection and interviewed the tubewell caretakers. Quality control activities included field checks of data collection and nightly questionnaire review for completion, consistency, and legibility. The survey was conducted in a two-week period in April and May 1994.

3.5 Data Management and Statistical Analysis

Questionnaire data were entered daily as field data collection proceeded. The data were entered by a trained and experienced data manager in a program developed using FoxPro 2.5. Range and consistency checks were performed at the time of data entry. Problems of out of range or inconsistent data were referred to the field supervisors for field checks and resolution. Data entry was complete within 3 days of completion of the fieldwork.

All analyses were performed using SPSS PC Version 4.0. For tests of statistically significant associations between two categorical variables, the Chi-Square Test or Fisher's Exact Test were used. Student's T-Test was used for comparison of the means of continuous variables. For comparison of ordinal or continuous variables not meeting parametric assumptions, the Mann-Whitney U-Test was used. For the comparison of diarrhea prevalence rates, a prevalence ratio was calculated, and the 95 percent confidence interval for the prevalence ratio was calculated using Meittinen's Test-Based Method (Meittinen, 1976). Confidence intervals for differences between means were calculated using standard methods for unequal variances (Armitage and Berry, 1987). Because many comparisons are being made, only p-values less than .01 are reported as statistically significant.

3.6 Analysis Strategy

In order to estimate the effects of each SAFE intervention model, measurements in the SAFE intervention areas are compared to the corresponding control areas. These comparisons are made independently for each model, so that the Model 1-SAFE intervention area survey results are compared to the Model 1-control area survey results, and likewise for Model 2. Comparisons between final survey results and baseline survey results are more difficult to interpret because changes may have occurred over time due to influences other than the SAFE intervention. These potential, other influences appear to have been small, and in most cases, final survey results in the control areas are similar to baseline results in the SAFE intervention areas. The results of both the baseline and final surveys in all 4 study areas (Model 1-SAFE, Model 1-Control, Model 2-SAFE, and Model 2-Control areas) are presented in graphic form for many key variables to illustrate these relationships.

The two SAFE intervention models, Model 1 and Model 2, are compared using a summary score. This score is designed to capture information on the key behavioral objectives (see section 2.4.2), as shown in the following tables:

Table 7a

SUMMARY SCORE OF BEHAVIORAL INDICATORS

INDICATOR	SCORE
Clean Water	
Only tubewell water is used for drinking (reported)	(0,1)
Tubewell water is kept pure by: not mixing pond water with tubewell water for drinking not using pond water to prime the tubewell (both reported)	(0,1)
Stored drinking water is kept clean in the following ways: Drinking water is stored in a Kolshi The Kolshi is kept covered with a lid (both observed)	(0,1)
Latrine Use and Feces Disposal	
All family members > 5 years of age usually defecate in a latrine (reported))	(0,1)
Young children (3-5 years of age) usually defecate in a latrine or fixed place (reported)	(0,1)
Children's feces are disposed of hygienically (demonstration, simulation)	(0,1)
Environmental Cleanliness	
Latrine is free of fecal contamination both inside and outside structure (observation)	(0,1)
Yard is free of human feces and garbage (observation)	(0,1)
At least 67% of family members in a community defecate in a hygienic latrine (reported latrine use and observed latrine type)	(0,1)

Table 7b

SUMMARY SCORE OF BEHAVIORAL INDICATORS

INDICATOR	SCORE
Hand Washing	
The respondent states all 6 key hand washing times (unprompted report)	(0,1)
The respondent demonstrates all 5 key elements of hand washing technique (demonstration)	(0,1)
Ash or Soap is available in the household (observation) A rag is kept exclusively for hand drying (observation) (both observed)	(0,1)
Food Hygiene	
Food is kept covered (observation) Pond water is not added to food after cooking (reported) (both)	(0,1)
Diarrhea Management	
ORS/LGS was used to treat the last episode of diarrhea in a child Correct ingredients and quantities for ORS preparation are known (both reported)	(0,1)
Breastfeeding was continued during the last episode of diarrhea in a child Normal Feeding was continued during the last episode of diarrhea in a child (both reported)	(0,1)

The range of possible scores was 0 (no desired behaviors or conditions) to 15 (all desired behaviors or conditions -- a perfect score). In some cases, for example where there was no child 3 to 5 years of age in the household, all measurements could not be made in a household. Scores were converted to percentages, where 100 percent is a perfect score. Scores were compared between SAFE intervention and control areas for each Intervention Model, between the two control areas, and between the two SAFE intervention areas. The latter comparison allowed for a summary comparison of the two different models of extension, Model 1 and Model 2.

The impact of the SAFE interventions on diarrhea rates was estimated by calculating the prevalence ratio as follows:

$$\frac{\text{Prevalence of diarrhea in the intervention area}}{\text{Prevalence of diarrhea in the corresponding control area}}$$

The prevalence ratio provides a direct estimate of the decrease in diarrhea due to the SAFE intervention (Kleinbaum, et al., 1982). For example, a prevalence ratio of .33 is interpreted to mean that the diarrhea rate in the SAFE area is one-third (.33) of that in the control area, or, conversely, diarrhea has been reduced by two-thirds in the SAFE intervention areas.

4. RESULTS

4.1 General Description of the Study Households

Of the 720 households included in the final survey, there were no children less than 5 years of age in 58 tubewell caretakers' households (18 in Model 1-SAFE, 16 in Model 1-Control, 12 in Model 2-SAFE, 12 in Model 2-Control areas). The distribution of the number of children 0 to 5 years of age in the household was similar in the SAFE and corresponding control areas (Table 8). SAFE intervention areas and corresponding control areas were also similar with respect to the mother's formal schooling, wall construction, and roof construction materials. In the Model 1 areas, families in control areas were significantly more likely to be Muslim, when compared to the SAFE area. By contrast, families in the Model 2 control area were less likely to be Muslim when compared to the corresponding SAFE area. These differences reflect local groupings of villages by religion. Households in the Model 2 SAFE area were significantly more likely to possess a radio or TV than in the corresponding control area (41% vs. 26%). Households in the Model 2 SAFE area were also significantly closer to the tubewell and more distant from the pond than the corresponding control area (Table 9). Household possession of a radio or TV and distances from the tubewell and pond were similar in Model 1 SAFE and control areas. The median number of user households per tubewell was significantly less in the SAFE areas compared to the control areas (15.0 vs. 20.0 user households per TW in the Model 1 area and 16.0 vs. 20.0 in the Model 2 area, SAFE vs. Control areas, respectively).

Table 8

SUMMARY OF CHARACTERISTICS OF THE STUDY HOUSEHOLDS

SAFE Final Survey

	Percent of Households			
	MODEL 1		MODEL 2	
Characteristic	SAFE	Control	SAFE	Control
Number of Children 0 to 5 years of age[1]				
One	54	56	60	61
Two	38	40	38	32
Three or more	7	4	3	7
Religion				
Muslim	67	87***	66	51**
Hindu	33	13	31	36
Buddhist	0	0	3	13
Mother's Formal Schooling (years)				
None	67	62	54	49
1 to 4	9	12	10	14
5 to 9	20	23	29	21
10 to 14	4	3	7	16
Household Possession of a Radio or TV	28	24	41	26*
Wall Construction				
Tin/Brick/Concrete	6	3	6	13
Straw/Bamboo/Mud	94	97	94	87
Roof Construction				
Tin/Concrete	64	59	46	45
Straw/Bamboo	36	41	54	55

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001

n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control) unless stated otherwise

[1] n=162,164,168,168

Table 9

SUMMARY OF ACCESS TO WATER SERVICES

SAFE Final Survey

Characteristic	Percent of Households			
	MODEL 1		MODEL 2	
	SAFE	Control	SAFE	Control
Distance to the Tubewell				
< 5 minutes	66	51	74	41***
5 - 20 minutes	32	45	25	51
> 20 minutes	2	5	1	8
Distance to the Pond				
< 5 minutes	57	57	68	85***
5 - 20 minutes	38	36	32	14
> 20 minutes	6	7	1	1
Median number of households per Tubewell	15.0	20.0***	16.0	20.0***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

4.2 Characteristics of the Tubewell Caretakers and Condition of the Tubewells

Characteristics of the tubewell area and tubewell caretaker are summarized in table 10. SAFE intervention and control areas are generally similar. More caretakers reported receiving training in hygiene education in SAFE areas (both Model 1 and Model 2) and garbage was less often observed near the tubewell in the SAFE area than in the control area (Model 1 only). Though keeping a hand washing site with ash and/or soap near the tubewell was discussed in intervention areas, few such sites were observed in the SAFE areas (7% and 13%, Model 1 and Model 2, respectively) and none was observed in the control areas.

Table 10

SUMMARY CHARACTERISTICS OF THE TUBEWELL AREA AND CARETAKER

SAFE Final Survey

	Percent of TW Areas or Caretakers			
	MODEL 1		MODEL 2	
Characteristic	SAFE	Control	SAFE	Control
CT Sex				
Male	13	0	33	77**
Female	87	100	67	23
CT Has Wrenches for Maintenance	37	33	37	33
CT Received Training				
TW Maintenance	13	0	27	7
TW Repair	7	0	13	3
Hygiene Education	60	13**	73	10***
Observations:				
Tubewell Has a Platform	100	93	97	90
Condition of the Platform/ Area Surrounding TW				
Feces Observed	0	7	0	1
Garbage Observed	0	47***	3	7
Ash or Soap at TW Site	7	0	13	0
Tubewell Functioning at the Time of the Survey	93	83	97	73

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001

n=30,30,30,30 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

4.3 Intervention - Process Measures

The SAFE intervention activities are summarized in tables 11 and 12. In both model areas, the target number of FE sessions with the CT (nine) was largely achieved (median 8.0 and 9.0, Model 1 and 2, respectively). About two-thirds of the user households were represented in the meetings, on average, in both model areas (data not shown). The completion of CT-only sessions was much less than the target in both model areas. Many more male sessions were held in the Model 2 area than in the Model 1 area. This greater number of male sessions in the Model 2 area reflects a change in the strategy for reaching males in that area after it was found that courtyard sessions were not effective in reaching men. In the Model 2 area, "spot sessions" were held with men at tea stalls, markets, and other gathering places, rather than attempting to attract men to courtyard sessions.

Table 11

SUMMARY OF SAFE INTERVENTION ACTIVITIES - MODEL 1 AND MODEL 2

	Female Sessions		Male Sessions	
	# of FE Sessions per CT Area	# of CT-Only Sessions per CT Area	# of FE Sessions per CT Area	# CT-Only Sessions per CT Area
PLANNED	9	9	9	9
ACHIEVED				
Model 1	8.0[1] (6 - 9)	3.0 (0 - 5)	4.0 (0 - 7)	0 (0)
Model 2	9.0** (7 - 9)	4.0* (2 - 7)	8.0*** (4 - 9)	0 (0 - 4)

n= 30 CT Areas (Model 1), 30 CT Areas (Model 2)
SAFE Model 1 vs. Model 2: *p<.01 **p<.001 ***p<.0001
[1] Median per CT Area
(range)

In the Model 2 SAFE intervention area, additional outreach activities included school programs, child-to-child sessions, and work through Key Community Persons (KCPs) as summarized in table 12. Through 8 primary schools, 3 secondary schools, and 14 villages where child-to-child sessions were held, a total of 18,168 child contacts was made (12,549+3,556+2,063). These contacts were multiple (i.e. the same child was contacted several times) and typically in larger groups, with a mean of almost 94 students per session in the secondary schools. A total of 50 KCPs was identified and targeted in the Model 2 area. Of these, 28 were women and 22 were men. Most KCPs were between 40 and 40 years of age, with a range of ages from 20 to 72 years. Many occupations were represented, including traditional birth attendants, traditional healers, doctors, businessmen, teachers, housewives, day laborers, and farmers.

Table 12

SUMMARY OF ADDITIONAL MODEL 2 INTERVENTION ACTIVITIES

Primary School Sessions	
Number of Schools	8
Sessions Per School	
Mean	29
Range	(24 - 36)
Total Number of Sessions	232
Mean no. Students/Session	54.1
Secondary School Sessions	
Number of Schools	3
Sessions Per School	
Mean	12.6
Range	(10 - 14)
Total Number of Sessions	38
Mean no. Students/Session	93.6
Child-to-Child Sessions	
Number of CT Areas	14
Number of Sessions per CT Area	8.5
Caretaker Presence at Session	92 (77%)
Mean Number of Participants per Session	17.3
Sessions with KCPs per CT Area	
Mean	8.3
Range	(5 - 15)

4.4 Knowledge of Diarrhea Prevention

Knowledge of the means to prevent diarrhea was dramatically increased in both Model 1 and Model 2 SAFE intervention areas compared to corresponding control areas (see Table 13). These rates were also increased compared to baseline values in the SAFE areas, but not so in the control areas. Contrasts of final survey results with baseline results for Clean Water and Latrine Use and Feces Disposal are shown in figures 3 and 4. No means of diarrhea prevention related to Environmental Cleanliness or Hand Washing as defined in Table 13 were reported in the baseline survey, in any of the four study areas. Differences in knowledge were highly statistically significant in all areas of prevention, and in both Model 1 and Model 2. In general, differences between control and SAFE areas were apparently greater in Model 2 than in Model 1, though these apparent differences between Models were not tested for statistical significance.

Table 13

SUMMARY OF KNOWLEDGE OF DIARRHEA PREVENTION

	Percent of Households			
	MODEL 1		MODEL 2	
Means of Prevention Mentioned	SAFE	Control	SAFE	Control
Clean Water[1]	77	15***	97	18***
Latrine Use and Feces Disposal[1]	70	6***	77	3***
Environmental Cleanliness[1]	64	0***	83	8***
Food Hygiene[1]	97	26**	97	42***
Hand Washing[2]	24	0***	75	0***
All Five Areas[3]	13	0***	54	0***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

[1] Mentioned at least one related means of diarrhea prevention

[2] Mentioned all 6 key hand washing times:
before food serving/handling; before eating; before feeding children; after defecation; after cleaning the child's bottom; after disposal of the child's feces

[3] All five of the above areas mentioned

Figure 3

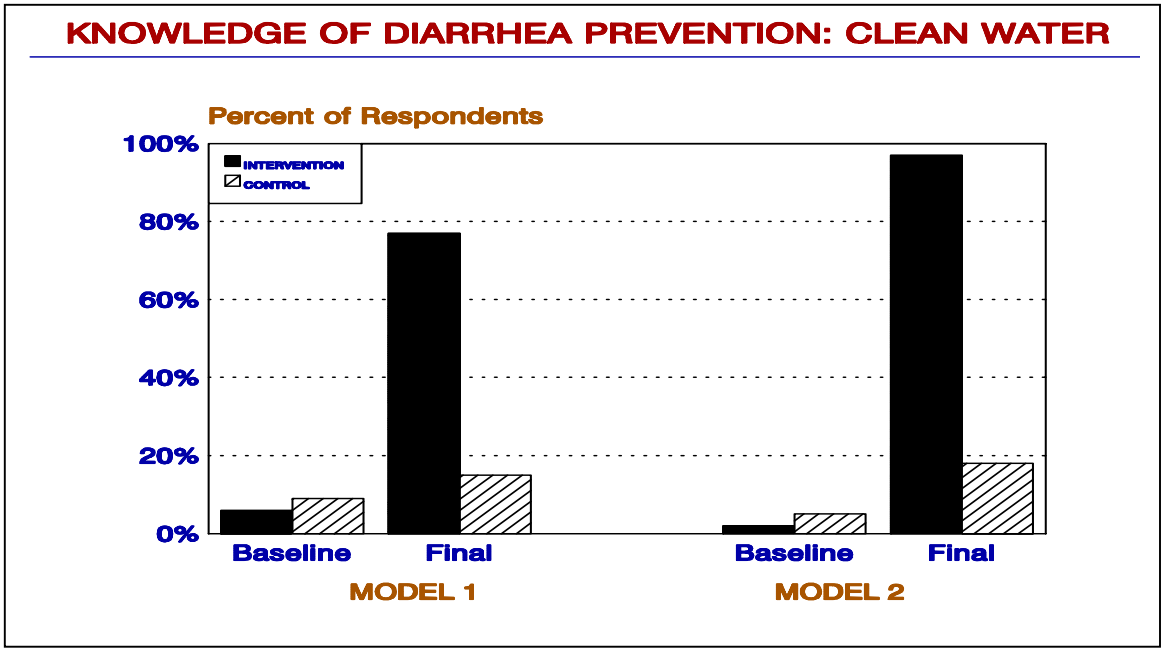
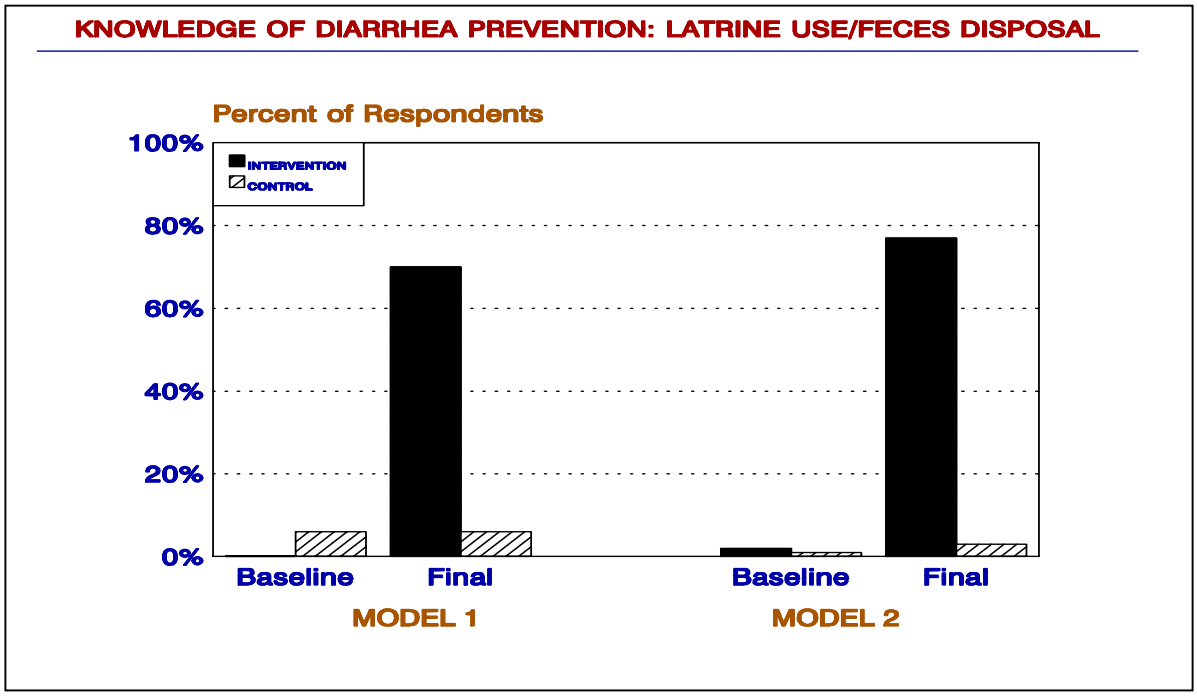


Figure 4



4.5 Clean Water - Water Source Selection, Use, and Storage

BEHAVIORAL OBJECTIVES

- Only tubewell water is used for drinking
- Tubewell water is kept pure by:
  - not mixing pond water with tubewell water for drinking
  - not using pond water to prime the tubewell
- Stored drinking water is kept clean in the following ways:
  - drinking water is stored in a Kolshi
  - the Kolshi is kept covered with a lid
  - the lid is kept clean
  - the Kolshi is kept clean
  - hands are kept out of contact with drinking water

4.5.1 Water Source Selection

Reported water source selection is summarized in table 14. In Model 1 areas, use of tubewell water for drinking was reported by all respondents, in both SAFE and control areas. In Model 2 areas, all respondents in the SAFE area reported use of tubewell water for drinking, but eleven percent of respondents in the control area reported drinking only pond water. Exclusive use of tubewell water for drinking was reported by 99 percent of respondents in both SAFE intervention areas (Model 1 and Model 2), 97 percent of respondents in the Model 1 Control area, and 88 percent of respondents in the Model 2 Control area. The higher use of pond water for drinking in the Model 2 Control area may be related to the higher proportion of tubewells not functioning in that area at the time of the survey (Table 10).

While the use of tubewell water for purposes other than drinking was not a specific SAFE behavioral objective, households in SAFE areas, in general, reported using tubewell water for cooking, bathing, and washing utensils more often than households in control areas. These differences were greater in Model 2 areas. Less than one percent used any water sources other than tubewells or ponds for these purposes, and there were no significant differences between areas (results not shown).

Table 14

SUMMARY OF WATER SOURCE SELECTION

Reported Water Source		Water use: Drink	Cook	Bathe	Wash Utensils
Tubewell:					
	M1-SAFE[1]	100[2]	39***	8	43***
	M1-Control	100	13	3	13
	M2-SAFE	100***	87***	29***	60***
	M2-Control	89	61	6	6
Pond:					
	M1-SAFE	1	73***	97	81
	M1-Control	3	94	97	89
	M2-SAFE	1***	19***	86*	81***
	M2-Control	12	39	95	94

---

[1] Model 1, SAFE Intervention Area

[2] Percent of households that use water source for this purpose; figures may add to more than 100 percent (tubewell + pond percents) because some households use multiple sources of water for a single purpose.

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001

n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

4.5.2 Water Use and Storage

Water use and storage practices are summarized in table 15. Respondents in control areas were significantly more likely to prime tubewells with pond water than were those in SAFE intervention areas. These differences were statistically significant for both model areas. Other water use and storage practices were generally very good in both SAFE and control areas. Drinking water containers were slightly more likely to be covered in SAFE areas than in control areas, in both Model areas.

Table 15

SUMMARY OF WATER USE AND STORAGE

	Percent of Households or Respondents			
	MODEL 1		MODEL 2	
Water Use Behavior	SAFE	Control	SAFE	Control
Use pond water to prime the tubewell	2	67***	1	44***
Mix pond water with TW water for drinking	0	0	0	3
Observation: Container used for storing drinking water[1]				
Kolshi	96	98	99	98
Other	4	2	1	2
Observation: Stored drinking water is kept covered[2]	100	94*	98	90**
Demonstration: Take water from storage container by pouring (rather than dipping)	100	100	100	100

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001

n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control) unless stated otherwise

[1] n=151,177,180,179

[2] n=151,171,172,171

4.6 Latrine Use and Feces Disposal

BEHAVIORAL OBJECTIVES

- All family members > 5 years of age defecate in a hygienic latrine
- Young children (3-5 years) defecate in a latrine or fixed place
- Children's feces are disposed of hygienically

4.6.1 Latrine Use

Mothers, men, and children over five years of age are significantly more likely to usually use a latrine for defecation in SAFE intervention than in control areas. This was true for both Model areas. Reported latrine use was equally high in Model 1 and Model 2 SAFE intervention areas. Both latrine use and fixed place use by children three to five years of age were significantly increased in SAFE areas, compared to control areas. Again, there were no apparent differences between SAFE Model 1 and Model 2 areas in this respect (Table 16).

Table 16

SUMMARY OF REPORTED LATRINE USE

	Percent who usually use a latrine for defecation			
	MODEL 1		MODEL 2	
Individual	SAFE	Control	SAFE	Control
Mother (respondent)	98	91*	99	93*
Man[1]	94	81**	94	75***
Child >5 years of age[2]	94	57***	94	64***
Child 3 - 5 years of age[3]				
Latrine	35	7***	39	8***
Fixed Place	56	20***	52	16***
Latrine or Fixed Place	91	27***	91	24***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1/SAFE, Model 1/Control, Model 2/SAFE, Model 2/Control) unless stated otherwise
[1] n=179,177,173,173
[2] n=139,132,145,146
[3] n=110,95,103,106

Most mothers used latrines for defecation at the time of the baseline survey, and this proportion increased somewhat in both SAFE and control areas in the final survey (Figure 5). The differences between baseline and final surveys, and between SAFE and control areas, are more dramatic for children three to five years of age - for latrine use (Figure 6), fixed place use (Figure 7), and for the use of either latrine or fixed place (Figure 8).

Figure 5

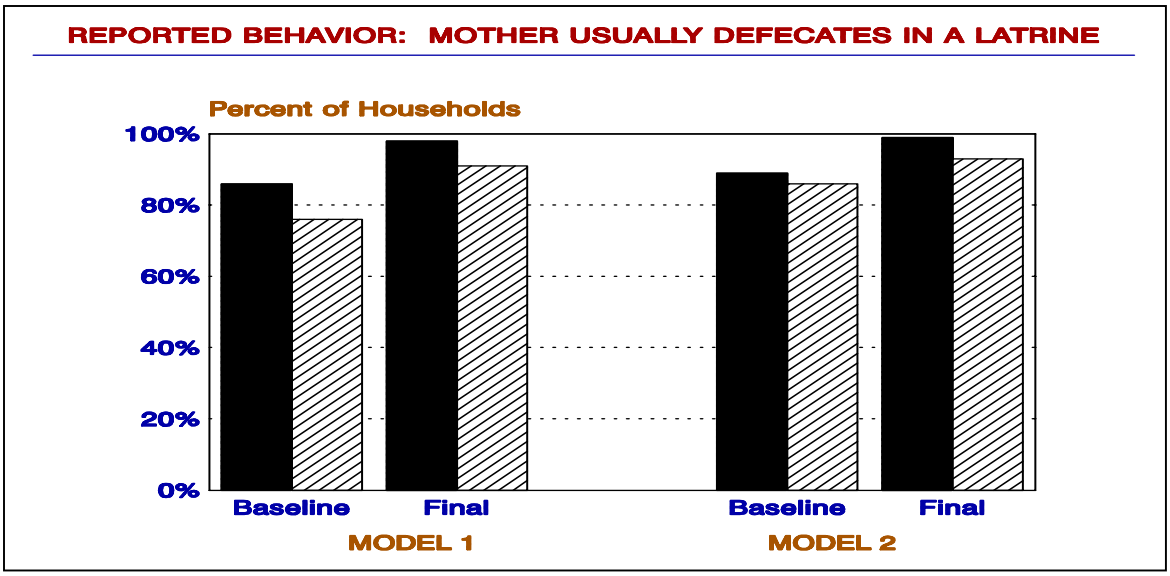


Figure 6

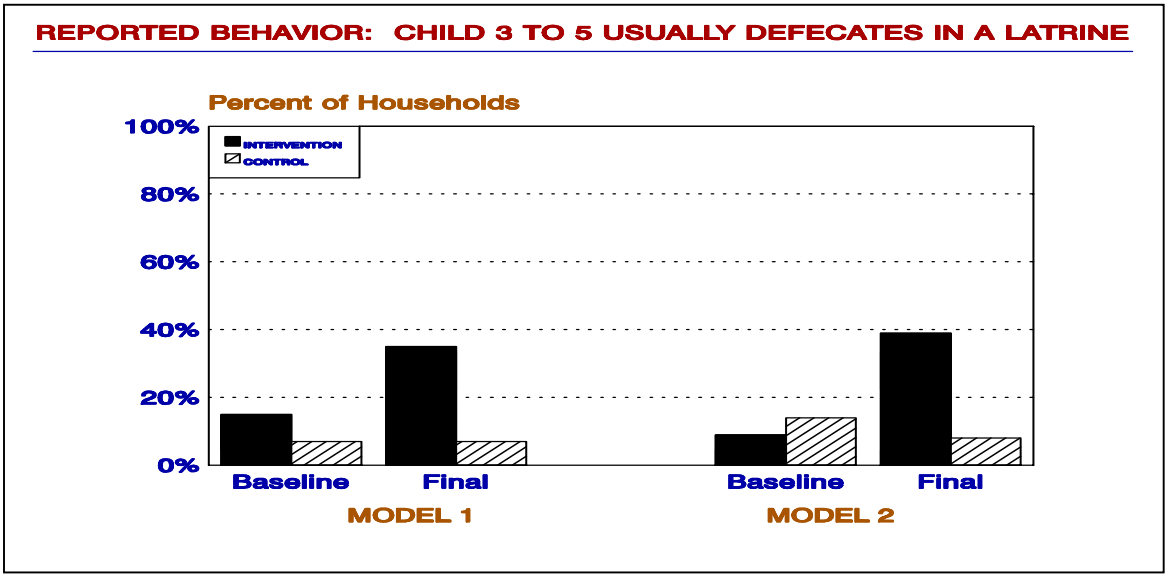


Figure 7

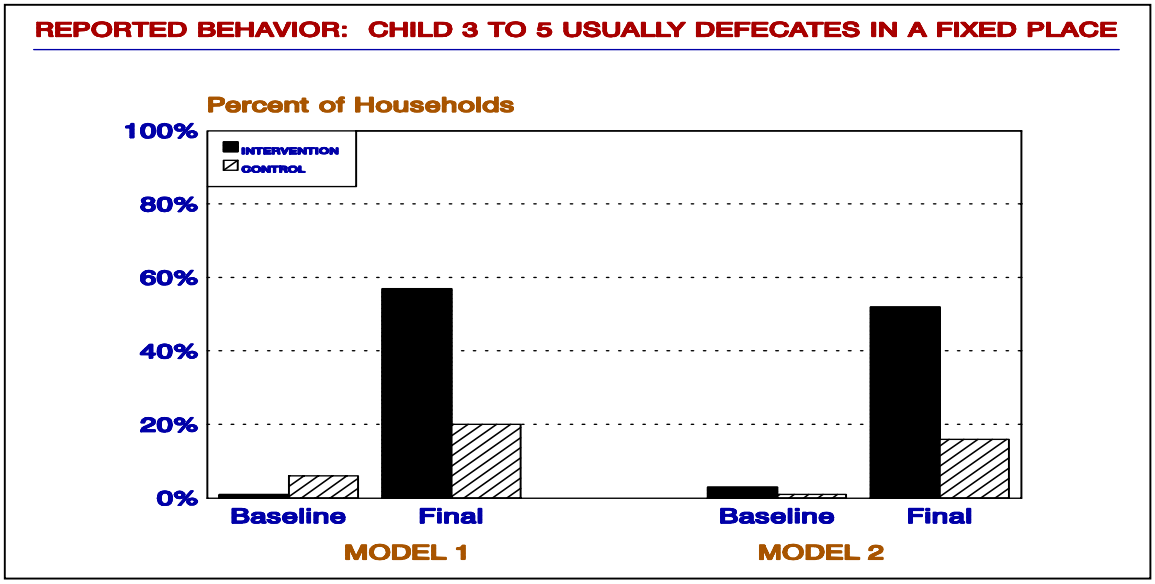
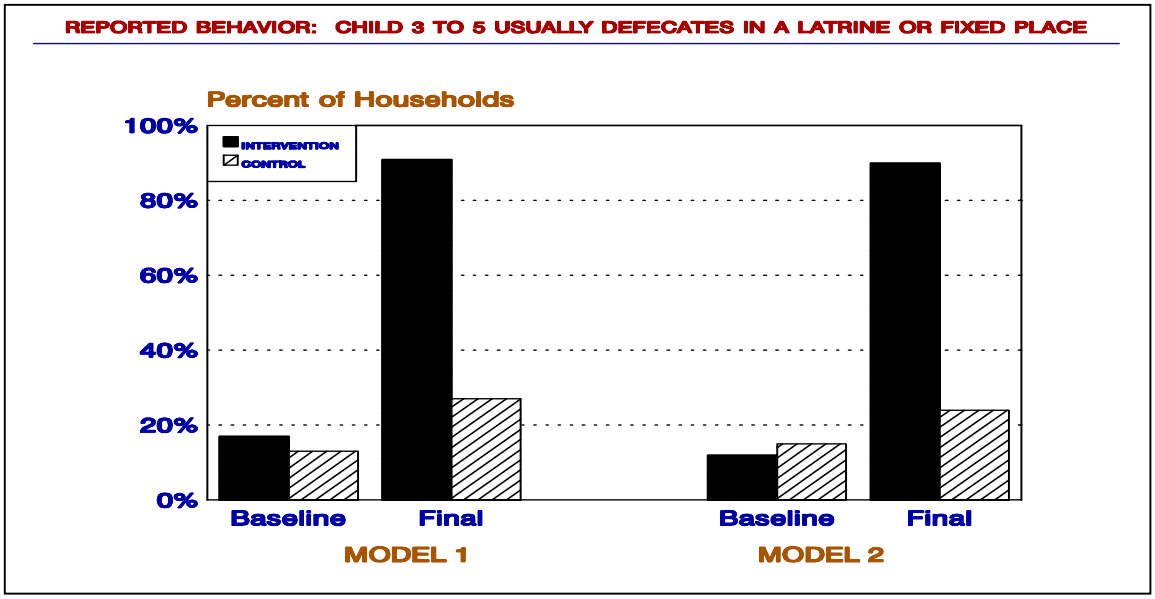


Figure 8



4.6.2 Latrine Access

Both household access to hygienic latrines and the community coverage with hygienic latrines were increased in SAFE intervention areas compared to control areas. These differences were more dramatic in the Model 2 areas than in the Model 1 areas, though large and statistically significant in all cases (Table 17, Figures 9 and 10). In the Model 2-SAFE area, 88 percent of household had access to a hygienic latrine and 87 percent lived in a community where at least 67 percent of the families have access to a hygienic latrine. This community coverage statistic is dramatic when compared to the low coverage in control communities and the low coverage in SAFE areas at the time of the baseline survey (Table 17, Figure 11).

Table 17

SUMMARY OF LATRINE ACCESS

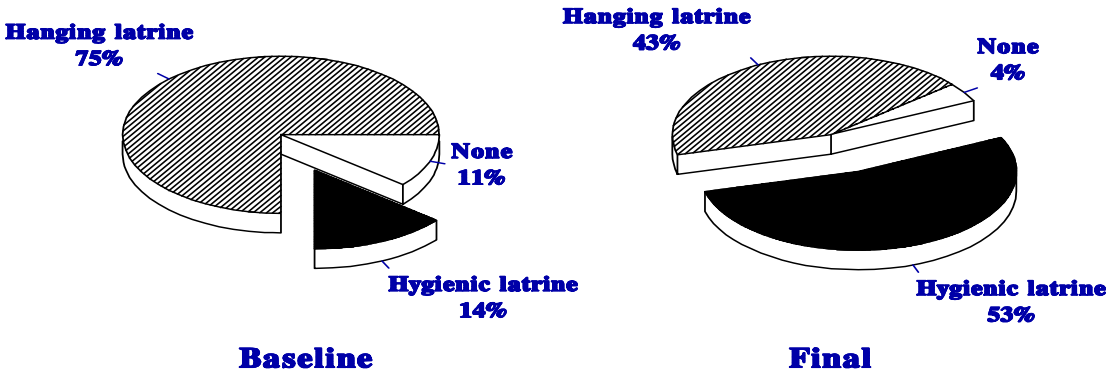
	Percent of Households			
	MODEL 1		MODEL 2	
Observed Latrine Type	SAFE	Control	SAFE	Control
Water Seal Latrine	26	18	52	3
Pit Latrine	26	2	33	3
"Sanitary Latrine"	1	3	3	4
Hygienic Latrine[1]	53	23***	88	11***
Hanging Latrine	43	68	11	80
No Latrine	4	9	1	9
Cluster Coverage with Hygienic Latrines				
0% Coverage	17	30	0	57
1-66% Coverage	37	57	13	40
>66% Coverage	46	13***	87	3***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control) unless stated otherwise
[1] Water Seal, Pit, or "Sanitary Latrine"

Figure 9

HOUSEHOLD LATRINE ACCESS

Model 1 - SAFE Intervention Area



Model 1 - Control Area

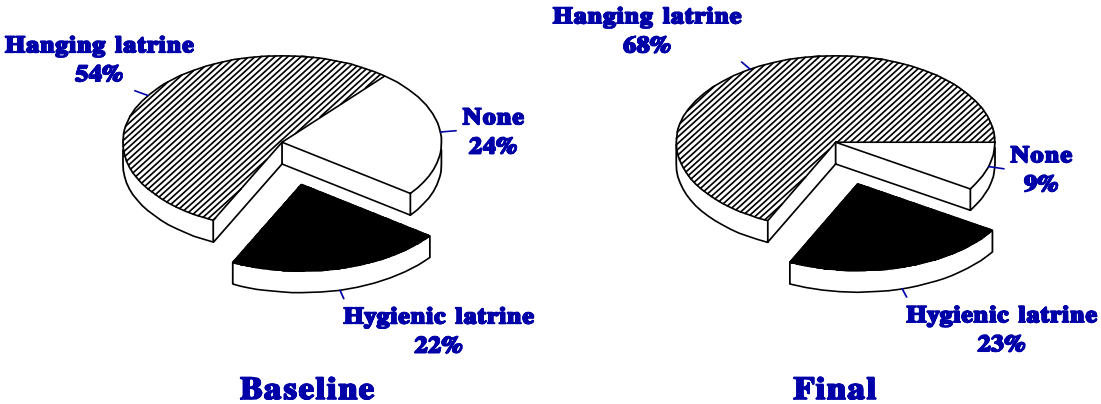


Figure 10

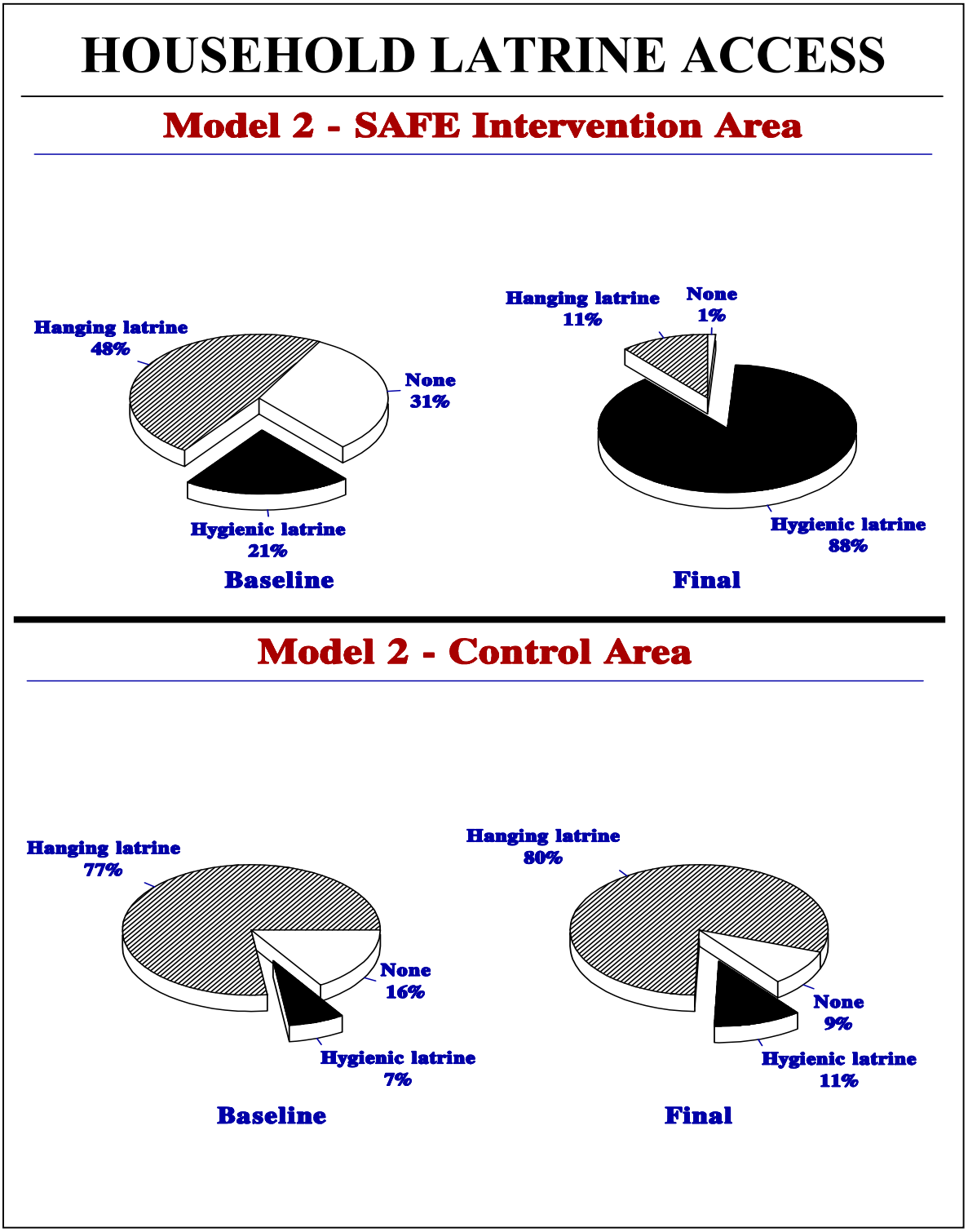
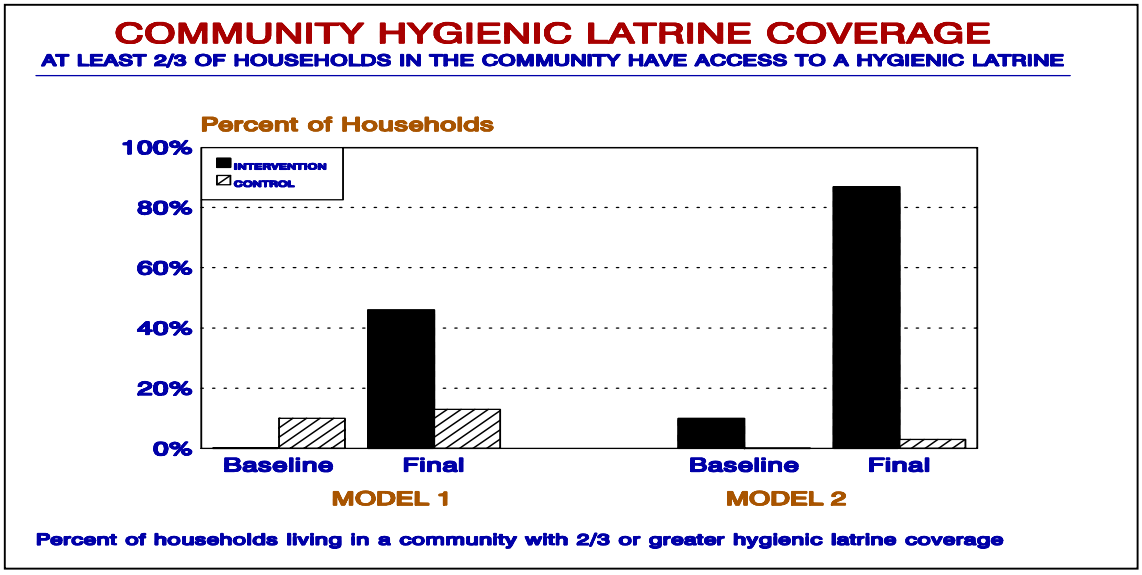

HOUSEHOLD LATRINE ACCESS
Model 2 - SAFE Intervention Area
Hanging latrine 48%
None 31%
Hygienic latrine 21%
Baseline
Hanging latrine 11%
None 1%
Hygienic latrine 88%
Final
Model 2 - Control Area
Hanging latrine 77%
None 16%
Hygienic latrine 7%
Baseline
Hanging latrine 80%
None 9%
Hygienic latrine 11%
Final

Figure 11



The level of "at least 2/3 of families in the community have access to a hygienic latrine" was chosen as the criterion for evaluating latrine coverage based on an analysis of baseline data which showed that it is at this level of community coverage where health benefits are seen (Bateman, et al., 1994). This level is also consistent with studies in other countries showing community coverage of improved sanitation at the 75% level to be associated with improved health (Bateman and Smith, 1991; Bateman, et al., 1993a).

4.6.3 Feces Disposal

Demonstrated disposal of feces from the yard by the mother was significantly more likely to be sanitary in the SAFE areas than in control areas. The differences between SAFE and control areas were apparently greater in Model 2 than in Model 1. Few mothers in either control area demonstrated sanitary technique in disposal of feces from the yard, whereas more than four out of five (82%) could do so in the Model 2-SAFE area (Table 18, Figure 12).

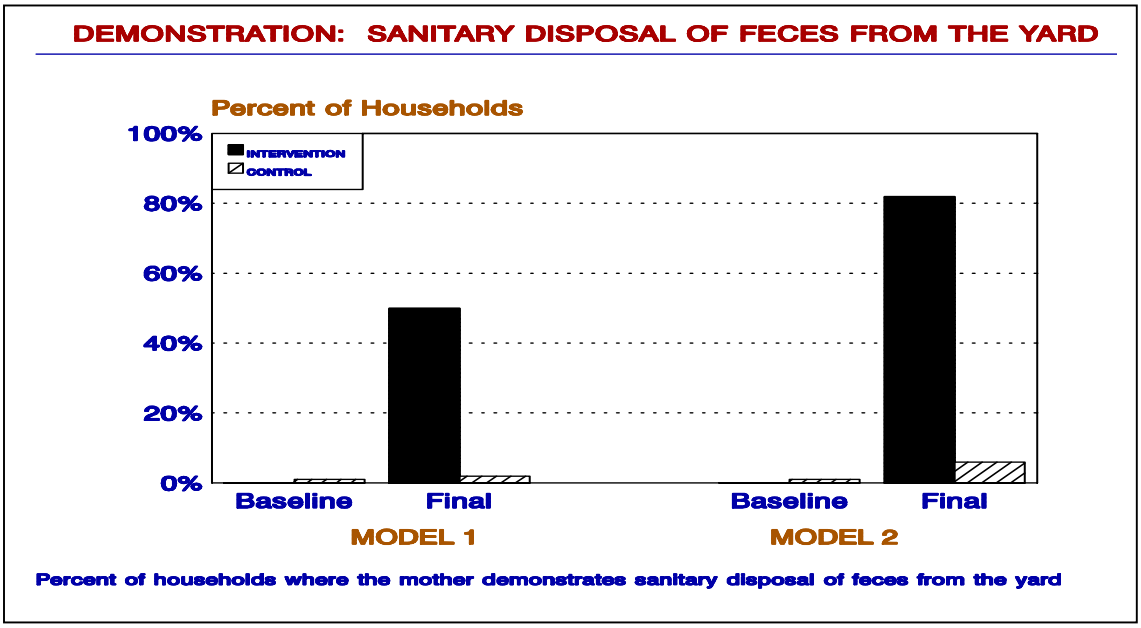
Table 18

SUMMARY OF FECES DISPOSAL FROM THE YARD

	Percent of Households			
	MODEL 1		MODEL 2	
Demonstration	SAFE	Control	SAFE	Control
Stool Disposal from the Yard by the Mother (Simulation)				
Sanitary	50	2***	82	6***
Unsanitary or Left Open	50	98	18	94

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

Figure 12



4.7 Environmental Cleanliness and Contamination

BEHAVIORAL OBJECTIVES

- Latrine is maintained clean (inside and outside)
- Yard is kept clean and free of human feces and garbage
- All community members defecate in a hygienic latrine

4.7.1 Latrine Cleanliness

Latrines were less likely to be soiled by fecal contamination in SAFE intervention areas than in control areas. This difference between SAFE and control areas was found in both Model areas, and for fecal soiling either inside or outside of the latrine structure (Table 19). In all areas, fecal soiling of latrines was less frequent at the time of the final survey than at the time of the baseline (Figures 13 and 14). This was due, at least in part, to the fact that monsoon rains had begun before the time of the final survey, whereas rains had not yet begun at the time of the baseline survey.

Table 19

SUMMARY OF OBSERVED LATRINE CLEANLINESS

	Percent of Latrines			
	MODEL 1		MODEL 2	
Characteristic	SAFE	Control	SAFE	Control
Feces Inside Latrine Structure				
None	88	53***	99	85***
One pile	12	34	1	13
Two+ piles	0	13	0	2
Feces Outside Latrine Structure				
None	92	55***	93	52***
One pile	7	29	6	42
Two+ piles	1	15	1	7

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=174,163,176,164 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

Figure 13

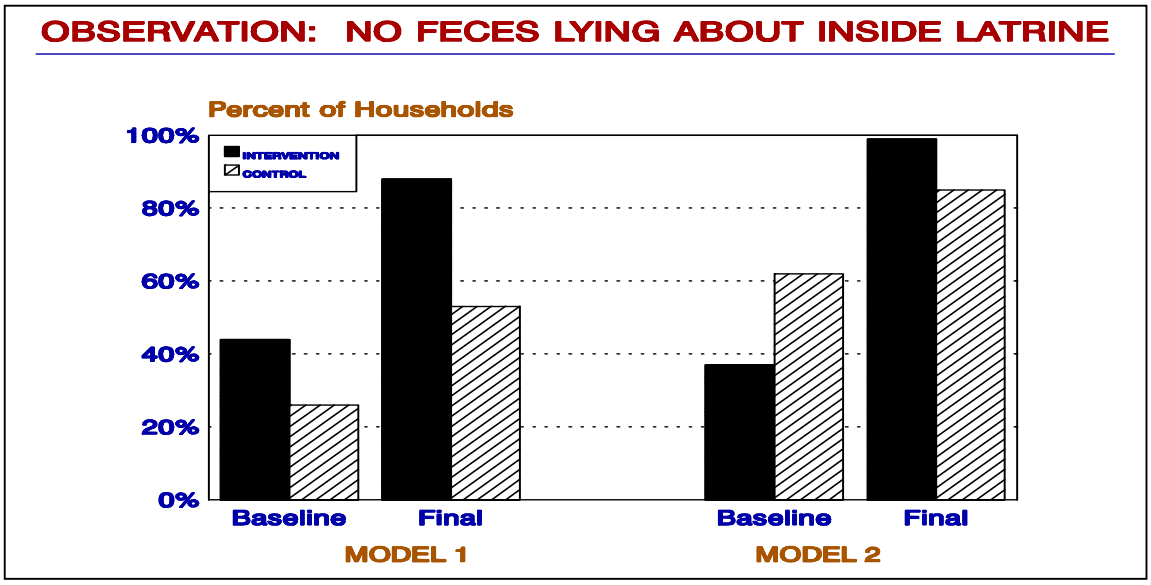
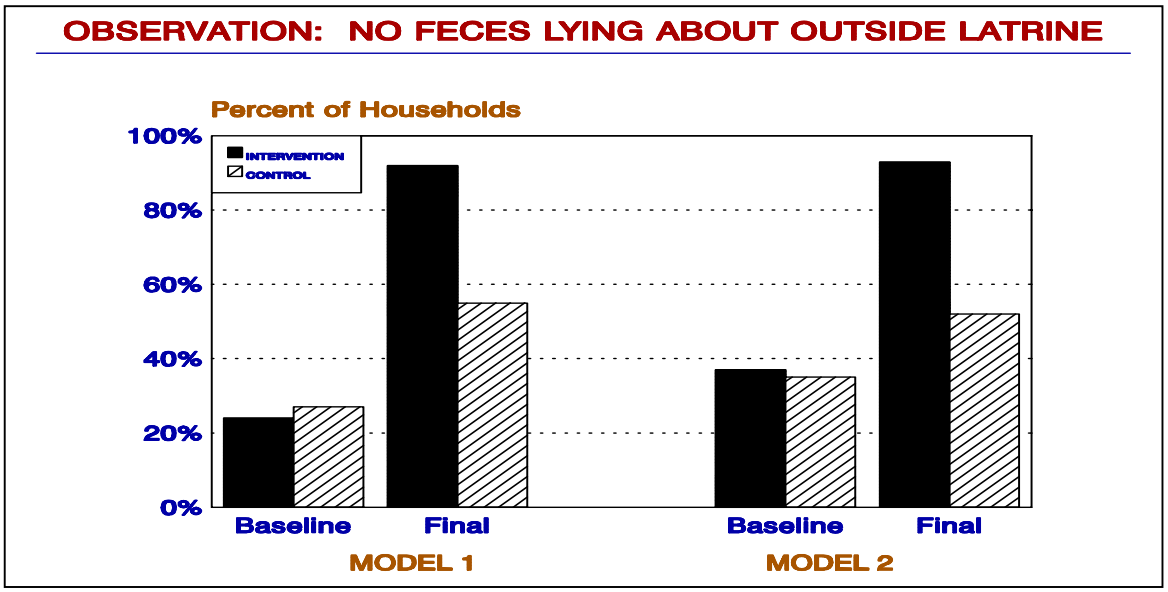


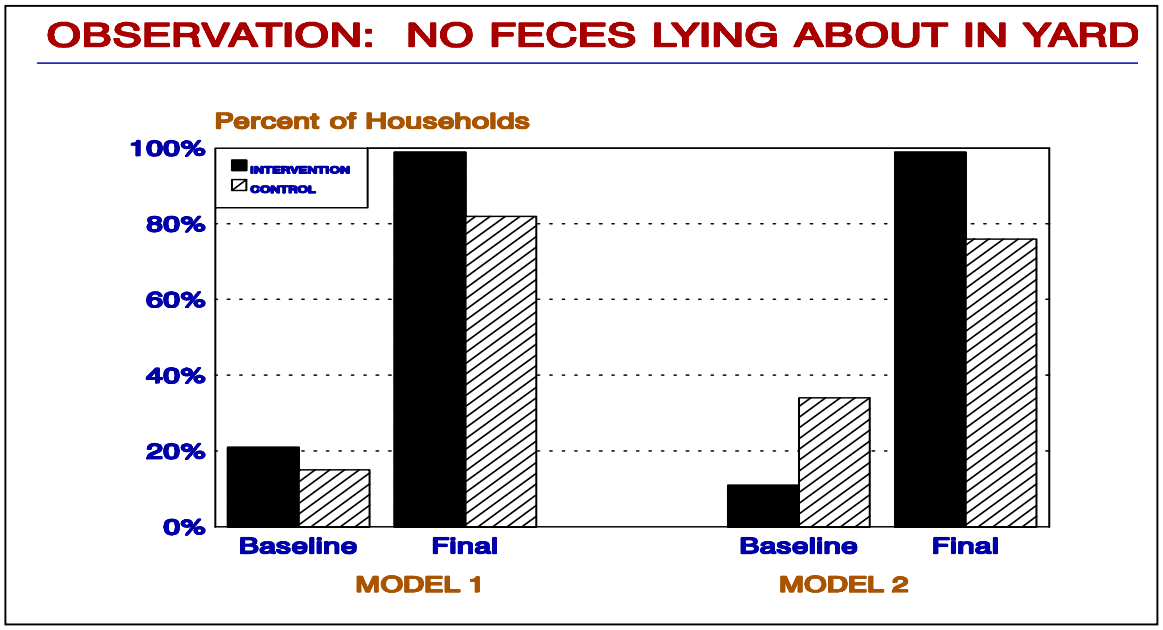
Figure 14



4.7.2 Cleanliness of the Yard and Household Area

Feces and garbage were also less often present in the yards of SAFE intervention areas than in control areas (Figure 15, Table 20). Again, observed contamination of the yard with feces and garbage is less than at baseline in control areas also, possibly due to early monsoon rains during the final survey.

Figure 15



4.7.3 Overall Community Usage of Hygienic Latrines

Community use of hygienic latrines was much higher in SAFE intervention areas than in control areas, or when compared to baseline (Table 20, Figure 16). Community use of hygienic latrines was measured as the proportion of all family members in surveyed households in a sampling cluster who were reported to usually use a latrine, and where the household's latrine was observed to be a hygienic latrine. The Model 2 SAFE area performed apparently better in this regard when compared to the Model 1 SAFE area (83% vs. 47% live in communities where 67% or more of community members use a hygienic latrine, Table 20).

Table 20

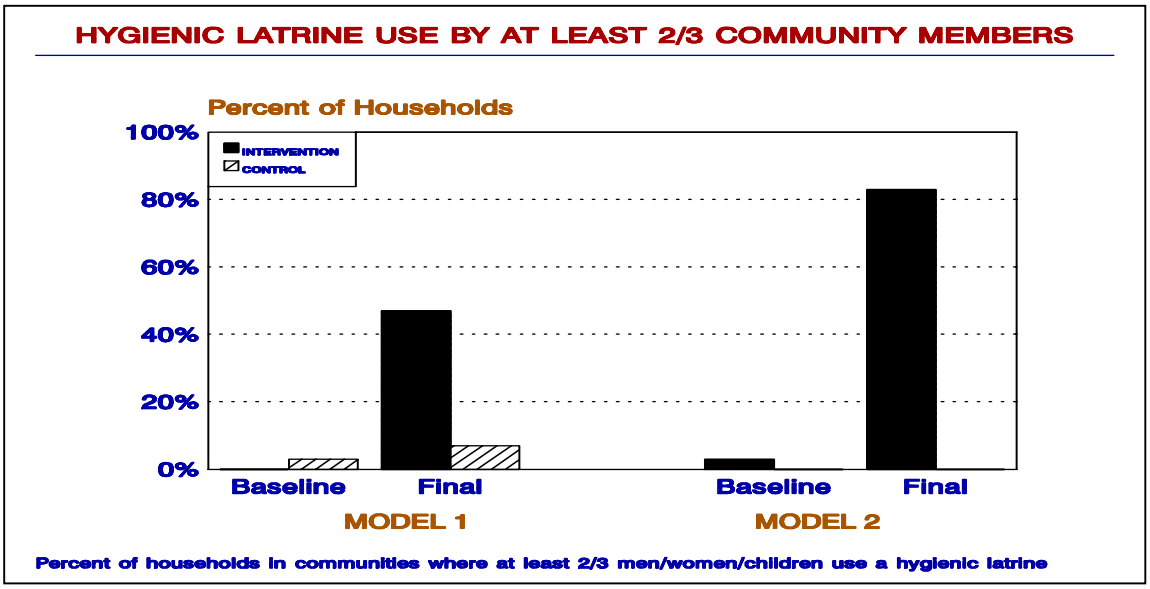
SUMMARY OF ENVIRONMENTAL CLEANLINESS

	Percent of Households			
	MODEL 1		MODEL 2	
Observation	SAFE	Control	SAFE	Control
Feces in the Yard				
None	99	82***	99	76***
One pile	1	17	1	21
Two+ piles	0	1	0	3
Garbage in the Yard	8	33***	7	65***
Community Hygienic Latrine Use				
No Community Members Use a Hygienic Latrine	17[1]	30	0	57
1 to 66% Use	37	63	17	43
67% to 99% Use	30	7	43	0
100% Use	17	0***	40	0***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

[1] Percent of households in Model 1-SAFE intervention area in communities (clusters) where none of the members (mother, man, child>5, child 3-5 years) in the sampled households reported usually using a latrine for defecation (or fixed place for child 3-5)

Figure 16



4.8 Hand Washing

BEHAVIORAL OBJECTIVES

- Hands are washed at the following 6 key times:
  - Before Eating
  - Before Feeding Children
  - Before Food Serving/Handling
  - After Defecation
  - After Feces Disposal or any Contact with Human Feces
  - After Washing the Child's Bottom (after defecation)
- Hand washing technique includes all 5 of the following key elements:
  - Uses water
  - Washes both hands
  - Uses ash, soap, or mud
  - Rubs hands at least three times
  - Hands are dried hygienically -- by air-drying or using a clean rag
- Ash or Soap for hand washing is kept available in the household
- A Rag used exclusively for hand drying is kept available in the household

Hand washing knowledge and practices, by all measures, were significantly improved in SAFE areas compared to control areas (Table 21). These differences were statistically significant for all practices, and in both Models. Knowledge of the six key hand washing times, demonstration of the good hand washing technique, and the observed availability of soap or ash in the household were also dramatically improved compared to baseline (Figures 17, 18, and 19).

Table 21

SUMMARY OF HAND WASHING BEHAVIOR AND RELATED CHARACTERISTICS

	Percent of Households			
	MODEL 1		MODEL 2	
Characteristic	SAFE	Control	SAFE	Control
Hand Washing Times:[1]				
All 6 Key Hand washing Times mentioned	33	0***	78	3***
Hand Washing Technique:[2,3]				
All 5 Key Elements Demonstrated	74	3***	82	16***
Observation: Ash/Soap Available in Household				
Near Kitchen	32	2***	74	12***
Near Latrine	56	2***	17	1***
Other Place in HH	7	21***	11	2***
Any Place in HH	92	25***	99	16***
Observation: Rag used exclusively for hand drying available in HH	81	6***	89	20***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001

n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control) unless stated otherwise

[1] 6 Hand Washing Times: Before food serving/handling; before eating; before feeding children; after defecation; after cleaning the child's bottom; after disposal of children's feces

[2] 5 Elements: Uses water; washes both hands; uses soap/ash/mud; rubs hands at least 3 times; uses a clean rag or air dries hands after washing

[3] n=180,172,180,179

Figure 17

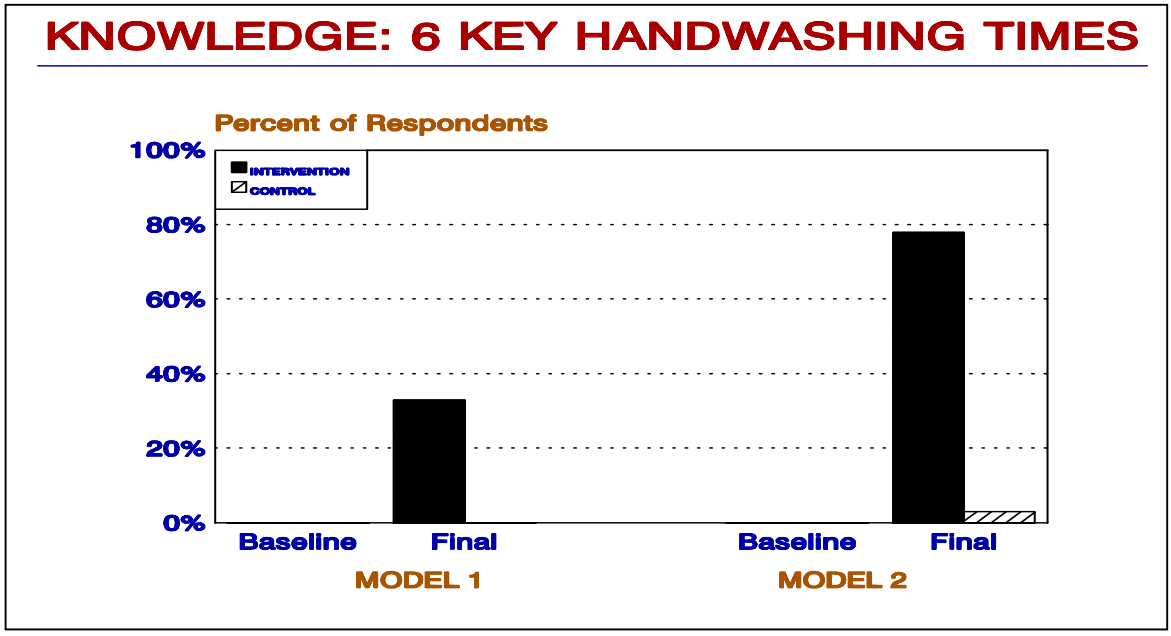


Figure 18

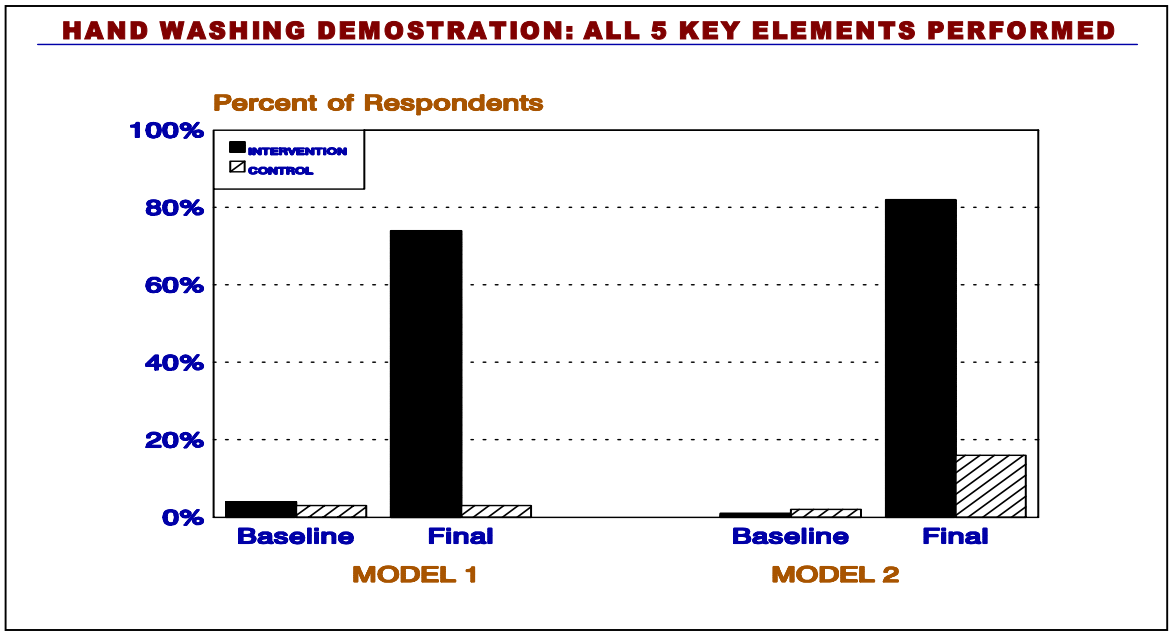
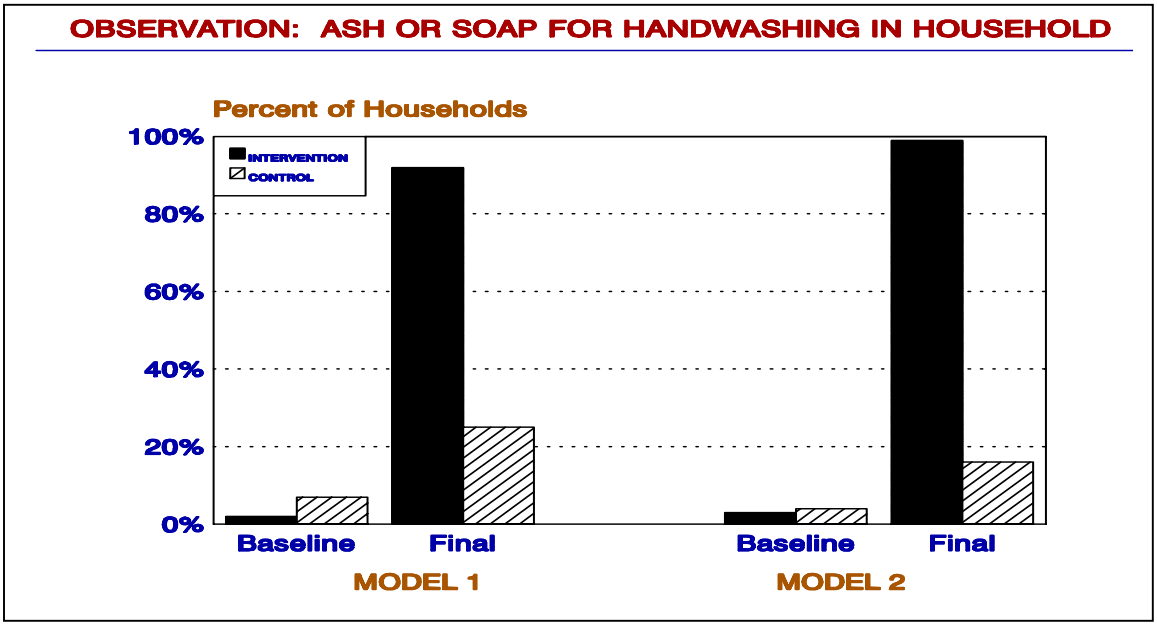


Figure 19



4.9 Food Hygiene

BEHAVIORAL OBJECTIVES

- Food is kept covered
- Infants less than 6 months of age are exclusively breastfed
- Pond water is not added to food after cooking

Food was observed to be covered in almost all households, in all areas. Exclusive breastfeeding practices were not surveyed. Reported addition of pond water after cooking was less in SAFE intervention areas than in control areas, for both Models. These differences are statistically significant (Table 22).

Table 22

SUMMARY OF FOOD HYGIENE BEHAVIORS

	Percent of Respondents			
	MODEL 1		MODEL 2	
Characteristic	SAFE	Control	SAFE	Control
Observation:				
Food is kept covered[1]	99	95	99	91**
Reported Behavior:				
Add pond water to food after cooking	10	54***	0	23***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control) unless stated otherwise
[1] n=163,151,169,130

4.10 Diarrhea Treatment

BEHAVIORAL OBJECTIVES

- ORS/LGS is given to treat diarrhea
- Correct ingredients and quantities are used for preparing LGS
- Breastfeeding is continued during diarrhea
- Normal feeding is continued during diarrhea

Diarrhea treatment is summarized in table 23. Labon Gur solution (LGS, a home-made salt and sugar solution) was more often reported to have been given during the last diarrhea episode in SAFE areas compared to control areas, for both Model 1 and Model 2. These differences were statistically significant. Overall, the rate of reported use of ORS or LGS was quite high in all areas (76% to 96%) -- representing more ideal behavior rather than actual behavior. Similarly, breastfeeding was continued during diarrhea in almost all cases. Rates for continued breastfeeding were apparently slightly higher in SAFE areas, but these differences with control areas were not statistically significant. Reported continuation of normal feeding was significantly higher in the SAFE areas compared to control areas, in both Models. Correct ingredients and quantities to make LGS were known to almost all respondents in the SAFE areas (87% and 96%, Model 1 and Model 2, respectively), but to relatively few respondents in the control areas (21% and 32%).

Finally, the knowledge of why ORS/LGS is used for treating diarrhea (i.e. for rehydration) was much higher in SAFE areas than in control areas. In summary, reported use of ORS/LGS is only slightly greater in the SAFE areas, but the improved supporting knowledge -- ingredients, quantities, and why to use it -- suggest that rehydration therapy is more likely to be adequately performed in SAFE households than in control households.

Table 23

SUMMARY OF DIARRHEA TREATMENT

	Percent of Respondents			
	MODEL 1		MODEL 2	
Characteristic	SAFE	Control	SAFE	Control
Reported treatment of the last episode of Diarrhea:[1]				
Gave ORS Packets	31	35	27	52***
Gave LGS	77	55***	84	42***
ORS or LGS	89	79	96	76***
Continued Feeding:				
Breastfeeding[2]	100	95	98	92
Normal Food[3]	87	59***	97	80***
Knowledge: Correct Ingredients and Quantities to Make LGS	87	21***	96	32***
Knowledge: States that Reason for Using ORS/LGS is Rehydration	52	14***	91	13***

SAFE Intervention vs. Control: * p<.01 ** p<.001 *** p<.0001
n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control) unless stated otherwise
[1] n=150,163,142,153
[2] n=70,80,99,75
[3] n=142,157,132,146

4.11 Health Impact: Diarrhea Rates

Differences in diarrhea prevalence between SAFE and control areas are summarized in table 24. In both Models, and for both 2-week and 24-hour diarrhea prevalence, there is a dramatic reduction in the SAFE areas compared to control areas, with an overall reduction of about two-thirds in SAFE intervention areas. A second round of 2-week and 24-hour diarrhea prevalence data, taken two weeks earlier than the data presented here, gave similar findings (results not shown). Differences in diarrhea prevalence between SAFE and control areas were insignificant at baseline (Figure 20). Overall, the 24-hour and two-week diarrhea prevalence rates are high in all areas, in both baseline and final surveys. The definition of diarrhea used here was liberal, 2 or more loose or watery stools, and all surveys were done at the peak of the main diarrhea season in the study areas. Also, household prevalence of diarrhea, that is prevalence in any child less than five years of age in the household, is reported. This household diarrhea prevalence is higher than the diarrhea prevalence based on individual children.

Figure 20

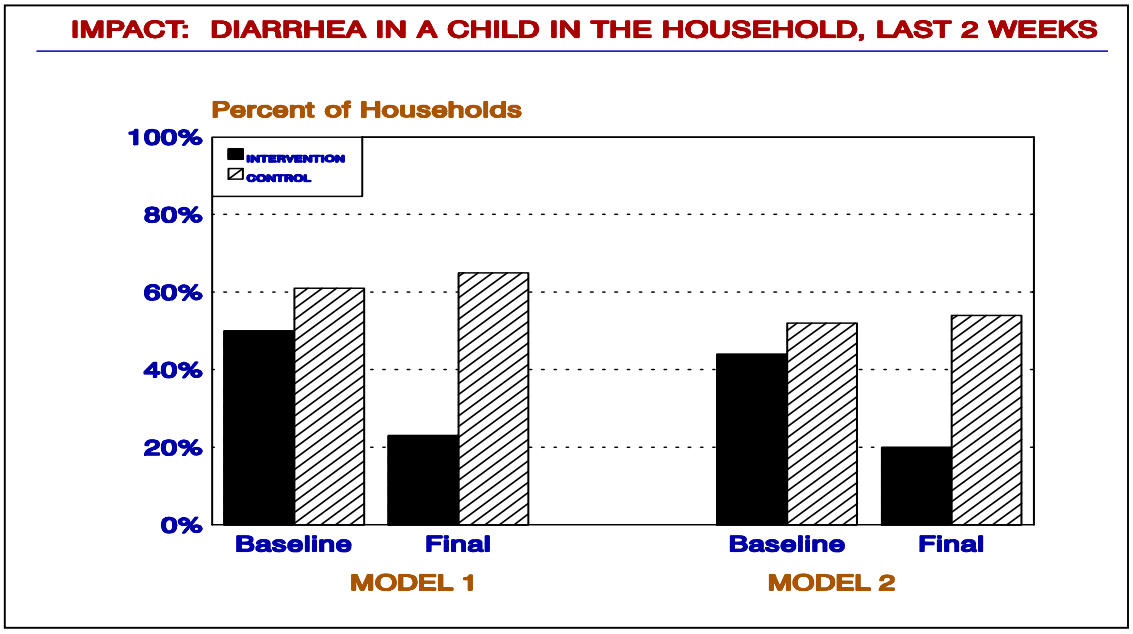


Table 24

HEALTH IMPACT: DIARRHEA PREVALANCE

	MODEL 1		MODEL 2	
	SAFE	Control	SAFE	Control
Household Prevalence				
Diarrhea in a child in the HH within the previous 2 weeks				
Percent of HH	23	65	20	57
Prevalence Ratio (SAFE/Control)	.34		.34	
95% C.I.[1]	(.25 - .48)		(.25 - .48)	

	MODEL 1		MODEL 2	
	SAFE	Control	SAFE	Control
Household Prevalence				
Diarrhea in a child in the HH within the previous 24 Hours				
Percent of HH	11	34	10	44
Prevalence Ratio (SAFE/Control)	.33		.23	
95% C.I.[1]	(.20 - .53)		(.14 - .38)	

---

[1] 95% Confidence Interval for the Prevalence Ratio

p<.0001 for all comparisons, SAFE Intervention vs. Control, Chi-Square Test

n=162,164,168,168 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

4.12 Comparison of the Two Intervention Models - Model 1 vs. Model 2

A score summarizing the overall level of achievement of behavioral objectives was developed and calculated for each of the 4 study areas (Model 1-SAFE area, Model 1-Control area, Model 2-SAFE area, Model 2-Control area). Development of the score is described in detail in Section 3.6 and tables 7a and 7b. The score was converted to a percent, where 0 is the worst score (no behavioral objectives achieved) and 100 percent is a perfect score.

Scores were much higher in SAFE intervention areas than in control areas, in both Model 1 and Model 2 (Figure 21, Table 25). The mean score in the Model 1 SAFE area was double the control area score (76.9% vs. 37.6%, SAFE vs. Control). In the Model 2 areas, the mean score in the SAFE intervention area was more than twice that of the control area (90.4% vs. 39.0%, SAFE vs. Control).

The two control areas were similar, whereas scores in the Model 2 SAFE intervention area were higher than scores in the Model 1 SAFE area (Figure 21, Table 25). The Model 2 SAFE intervention performed significantly better than Model 1 both by direct comparison of the two intervention areas and by comparison of the differences between the intervention and control areas for each model (Table 25).

Figure 21

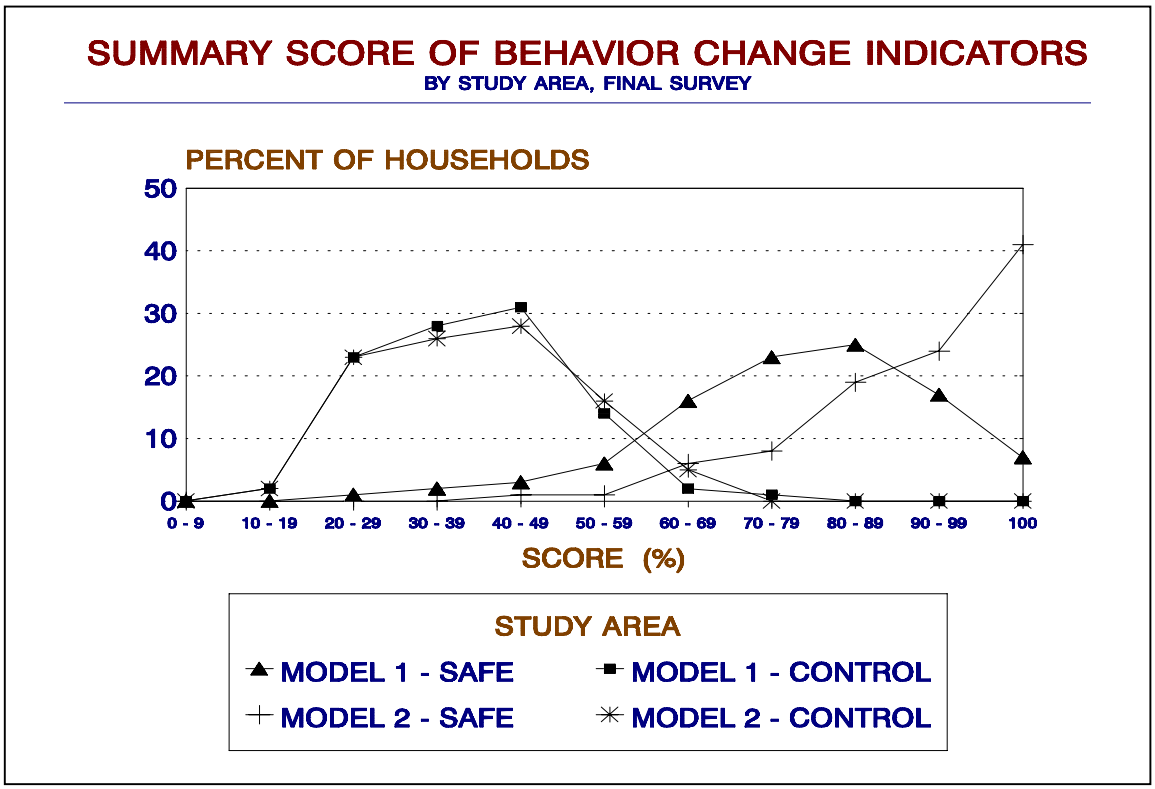


Table 25

SUMMARY SCORES OF BEHAVIOR CHANGE INDICATORS
COMPARISONS OF STUDY AREAS

	MODEL 1		MODEL 2	
	SAFE	Control	SAFE	Control
Mean Score (%)	76.9	37.6	90.4	39.0
(s.e.)[1]	(1.2)	(0.8)	(0.8)	(0.9)

SAFE vs. Control	Difference (%)	C.I.[2]
Model 1/SAFE - Model 1/Control	39.3	(36.7 - 42.2)
Model 2/SAFE - Model 2/Control	51.4	(49.1 - 53.8)
Model 2 vs. Model 1		
Model 2/Control - Model 1/Control	1.4	(-0.9 - 3.7)[3]
Model 2/SAFE - Model 1/SAFE	13.5	(10.6 - 16.3)

---

n=180,180,180,180 (Model 1-SAFE, Model 1-Control, Model 2-SAFE, Model 2-Control)

[1] Standard Error of the Mean

[2] 95% Confidence Interval for the Difference

[3] No statistically significant difference between Control areas

In summary, there were large overall improvements in the behavioral indicators in SAFE intervention areas when compared to control areas. Model 2 SAFE intervention performed better than the Model 1 SAFE intervention area, though this difference in mean score (about 13 percent) was much smaller than the differences between the SAFE intervention and control areas (Model 1 difference: 39.3 percent; Model 2 difference: 51.4 percent).

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions on the Main Findings

5.1.1 Comparability of the Study Areas

- The SAFE intervention and control areas are generally comparable for socio-demographic profiles and characteristics of the tubewell area and caretaker, in both Model 1 and Model 2 areas. Differences in water access between SAFE and control areas were small. The SAFE intervention and control areas were generally similar at baseline, in both Model 1 and Model 2 areas. The differences between SAFE intervention and control areas in the Final Survey may be interpreted as an estimate of the effect of the SAFE interventions.

- In the Final Survey, conditions in the control areas were similar to baseline, or slightly improved. Improvements in the control areas, which are geographically adjacent to the SAFE intervention areas, may represent spillover influence (diffusion) of the SAFE intervention, or the effect of other, outside influences. If there was a significant spillover of SAFE interventions to control areas, the observed differences between SAFE intervention and control areas may underestimate the true effect of the SAFE interventions.

5.1.2 The SAFE Interventions -- Process and Outputs

- Group sessions with women, organized with the Caretaker and the SAFE field extensionist were the most successful in reaching the program targets for number of sessions held. Sessions organized with the caretaker alone and male sessions were less likely to be held as often as initially scheduled.

- School programs, child-to-child sessions, and sessions with Key Community Persons came very close to meeting targets. These are programmed primarily by SAFE staff (field extensionists).

- The direct involvement of the SAFE field extensionist appears to be key to the success of sessions actually taking place. The experience recorded here suggests that when SAFE staff leave an area, organized extension activities will cease immediately, or soon thereafter.

- Holding group sessions with men appears to be a special problem. "Spot Sessions" with men, organized at tea stalls, markets, and other locations as opportunities arose, were more successful than courtyard sessions in reaching men.

5.1.3 Behavior Change Indicators

- Dramatic improvements were seen in all areas of intervention, for all targeted behaviors, and by all measures -- knowledge, reported behavior, demonstrated practices, and observations. These results provide very strong evidence that the SAFE approach can be effective in improving hygiene behaviors and reducing the incidence of diarrhea in children. The scope and scale of improvements in hygiene behaviors are greater than any previously reported (Stanton and Clemens, 1987).

- Community members generalized the concept and importance of clean water vs. contaminated water. This was illustrated by more SAFE intervention households than control households using tubewell water for cooking, bathing, and washing utensils. Even though the "perfect" behavior (using tubewell water exclusively for all household purposes) was not promoted, the SAFE intervention -- which focusses on only a few, specific water use behaviors -- led to understanding and motivation that contributes to that long-term goal.

5.1.4 Comparison of the Two Intervention Models - Model 1 vs. Model 2

- Model 2 apparently performed better than Model 1 by most measures, in all of the areas of behavior studied.

- In the summary score (see section 4.12), which looked at overall differences in behavioral indicators rather than differences in specific areas of behavior, Model 2 performed significantly better than Model 1. Even so, the difference between Model 1 SAFE Intervention and Model 1 Control areas is much greater than the difference between the Model 2 and Model 1 SAFE Intervention areas. Caretaker sessions alone (Model 1) are worthwhile and have important benefits. Model 1 is a very good intervention; Model 2 (with multiple channels of communication) is a better intervention, by these measures.

- Model 2 may also have important advantages in terms of sustainability that were not demonstrated in this evaluation. It must be emphasized that this analysis provides little information relevant to the issue of sustainability, since changes were measured only over an initial 9-month period of intervention.

- The dramatic differences between intervention and control areas, together with the smaller differences between the two intervention areas, suggests that the key elements of a successful hygiene behavior change program may be those that are similar in both models. These similarities include focussing on a few, key behaviors, community participation in all aspects of the project, participatory extension methods, and a system of continuous monitoring and improvement of the interventions.

5.1.5 Health Impact: Diarrhea Rates

- The reduction in reported diarrhea prevalence in intervention areas, when compared to the control areas, supports the findings on behavior change in the SAFE intervention areas. It also indicates that the process of selection of key behaviors for focussing the interventions was successful in identifying those behaviors where improvements would lead to reduction in diarrhea.

- The estimated reduction by two thirds in diarrhea prevalence due to SAFE interventions is greater than any previously reported in the scientific literature for a hygiene behavior change intervention. It is also greater than the mean reduction in diarrhea reported for programs that include water and sanitation hardware (Esrey, et al., 1991). This finding, together with similarly dramatic improvements in hygiene behavior (see 5.1.3), suggests that the SAFE approach should be promoted as a model for hygiene behavior change and diarrhea prevention.

5.2 Recommendations for SAFE and Other Community-Based Hygiene Behavior Change Programs

5.2.1 The Key Features of a Successful Hygiene Behavior Change Program

Based on the overall SAFE experience, the following guidelines are recommended for community-based hygiene behavior change programs:

- Focus on the relationships between behavior, the environment, and health.
- Focus on behaviors, rather than messages or hardware targets.
- Base interventions on the local context (existing beliefs, norms, and practices).
- Focus on a few key behaviors rather than a large number of "perfect" behaviors.
- Emphasize community participation in all aspects -- design, development of interventions, extension, monitoring, problem solving, etc.
- Emphasize the need for community-wide participation and community action to improve the environment and health for all community members.
- Develop and implement a behavior-based monitoring and improvement system for refining the intervention. Identify and analyze problems, and develop realistic solutions with community members.

5.2.2 Improving the SAFE Interventions

- Insights and lessons learned regarding the intervention process should be gained primarily through qualitative investigations. Quantitative surveys can provide information on what happened, with little information on why it happened.

- Recognizing that behavior change is a long-term process, SAFE must make provision for long-term interventions in communities, either through direct SAFE activities, or through facilitating the development within the community of sustainable systems for continued hygiene improvements.

- Programs focusing on long-term behavior change need to plan for continuous reinforcement of positive behaviors. This should take into account that, though individuals may change behaviors in the short term, a certain amount of relapse should be expected and planned for. Additionally, social pressures and norms will inform and govern behavior, and these influences change slowly. For these reasons, a focus on how to help individuals and communities maintain behavior changes should be a part of behavior change programs.

- Means to devolve responsibility for organizing hygiene behavior change activities to the community need to be sought. Many avenues may be explored, from continuing similar sessions with a community person in charge, to evolving away from initial, group sessions to other means of communication and community action.

- More effective means of working with men need to be developed. Group sessions similar to those that work well with women may not be appropriate for men. The differences between men and women in social activities, communication patterns, and daily schedules should be taken into account when developing new means to reach men. Barbershops, tea stalls, markets, and other public areas where men gather may be particularly useful to explore.

- For priority setting in SAFE interventions, those behaviors that are already adequate in nearly all households, such as drinking tubewell water, covering stored water, and using a kolshi, should be reinforced, but may receive less emphasis and reiteration than some behaviors with 'further to go', such as not priming tubewells with pond water, or hand washing behaviors. Just as priorities need to be set to reduce the number of behaviors targeted, setting priorities in the amount of time and effort spent among the targeted behaviors may improve program efficiency.

- There is no need to consider adding latrine 'hardware' to the SAFE approach. Limited additional information on latrine design and latrine availability in the market may be helpful to facilitate the installation of hygienic latrines by community members.

- Indicators of access to clean water (functioning tubewells) should be added to SAFE monitoring activities. Linkages between SAFE and those supporting tubewell repair and installation (both governmental and non-governmental agencies) need to be developed to improve access to clean water where necessary.

- SAFE staff must be prepared to give technical advice on latrine emptying, and other aspects of latrine maintenance. The SAFE intervention has created a large market for this information, with many hygienic latrines being built. If these issues are not addressed soon, early successes in increasing hygienic latrine use will be eroded as latrines fill and these services break down.

- Interventions should continue to constantly evolve if SAFE is to continue in its early successes. For example, an intermediate solution for defecation by small children, which was developed with community mothers, is a fixed defecation place for use by children 3 to 5 years of age. Out of this solution have grown other challenges, including maintenance and feces disposal from the fixed sites. Another round of problem analysis and development of alternatives is now needed. SAFE interventions and the SAFE process should continue to be dynamic to be effective.

5.2.3 Model 1 vs. Model 2 -- Selecting the Channels for Extension

- Hygiene behavior change interventions typically are not implemented in isolation, but are implemented as a part of larger community-based health and development programs. The extension methodology must be tailored to integrate into the larger program and complement other activities; The additional benefit of Model 2 over Model 1 in terms of behavior change should not be the only consideration when designing a hygiene behavior change component that must be integrated into a larger program. Other issues, such as the current outreach strategy and target populations, resource availability, and experience of staff, should also be taken into consideration.

- The comparison of Models 1 and 2, with limited and expanded activities in the community, respectively, have demonstrated that even limited outreach activities can have important benefits, where the program is well designed. The addition and integration of even limited hygiene behavior change activities into larger health and development programs may have important benefits for the community.

    - The Model 2 intervention is the extension model of choice, where it is possible to implement.

    - The Model 1 intervention (Caretakers groups only) is useful to implement alone, in situations where an expanded model of extension is not possible.

5.2.4 Integration of Hygiene Behavior Change with Hardware Interventions

- The SAFE interventions took place in the context of a high profile national latrine promotion campaign. The lack of increase in hygienic latrine coverage in control areas over the twelve months between the baseline and final surveys suggests that this national campaign alone will have limited impact in the short run. On the other hand, the dramatic increase in hygienic latrine coverage in the SAFE intervention areas may in part be due to the complementarity between the national campaign and SAFE's community-based approach.

- SAFE was very successful in "creating a market" for hardware (latrines) -- even when hardware was not an explicit project goal. This experience suggests that software (hygiene behavior change activities) should logically begin before hardware interventions, in programs that include hardware.

- While the need to include hygiene behavior change activities in water and sanitation projects is often emphasized, the reverse should not be overlooked. Adequate hygiene behaviors do require hardware support -- and there are many outstanding problems on the hardware side of the equation that require continued study and improvement. The SAFE intervention benefited from recent work and promotion of latrines in Bangladesh, with improved designs and increased local availability of water seal latrines. On the other hand, out of these improvements, new problems arise -- such as pit filling -- for which adequate solutions have not yet been devised. Continuing dialogue, coordination, and collaboration between those working on hygiene behavior change and those addressing the continuing challenges in hardware needs to take place at the project, program, and policy levels.

- The SAFE pilot project and surveys were conducted in areas where community members have access to tubewells. The success of the SAFE interventions was certainly dependent, to some extent, on access to safe water supplies. In areas where there is no such access, or where access if very limited, integration of water supply hardware interventions with SAFE activities will be important. Again, in programs that include both hardware and software, software (hygiene behavior change activities) should begin before hardware activities

- Integration of hardware and software programs requires an appropriate mix of professional leadership. While the hardware component requires specific skills (e.g. engineering), the software component requires adequate input from public health, behavioral science, education, and community development specialists.

5.3 Recommendations for Health and Development Programs in General

5.3.1 Diarrhea Prevention Is an Important and Achievable Program Goal

- Diarrhea is a ubiquitous health problem in the developing world and diarrhea prevention is an achievable goal. Twenty five years after the discovery of Oral Rehydration Solution, worldwide an estimated 3 million children die from diarrhea-related causes every year. In the majority of communities in developing countries, diarrhea continues to be the most important cause of mortality in children under five years of age. The SAFE Pilot Project demonstrates that substantial reduction in diarrhea is possible, within common program constraints. Diarrhea prevention should be a priority for programming where health improvement is a concern.

- Progress towards behavior change and diarrhea reduction objectives should be measured. Programs that do not lead to a significant reduction in diarrhea in communities such as those in the SAFE Pilot Project should not be considered a success. A reduction in diarrhea of at least 33% is offered as a guideline for what should be considered a "significant" reduction.

- Since diarrhea occurs so frequently, community members may not recognize the extent to which common diarrhea can be prevented. Interventions should focus on the fact that diarrhea, as well as other diseases, can be prevented -- and the means to do so. For diarrhea and many other diseases, understanding of the relationships between one's health, what one does (one's behavior), and the environment should be emphasized. This understanding provides the basis not only for the prevention of diarrhea, but also for other environmental health and disease prevention interventions.

5.3.2 Improved Water, Sanitation, and Hygiene Behavior Provides Benefits in Addition to Diarrhea Prevention

- In many communities, diseases other than diarrhea that are related to water, sanitation, and hygiene behaviors are important causes of illness and death. Guinea Worm (Dracunculiasis), Schistosomiasis, and Dengue Fever are some examples of diseases that are major health problems in some communities and would provide a good focus for hygiene behavior change interventions in those communities.

- In addition to direct effects to improve health, improved water, sanitation and hygiene may have other important benefits, such as time released for women, household irrigation and animal watering, promotion of commercial activity, improved community organization, and improved quality of life.

- In any case, behavior change interventions should focus on the potential benefits of improved water, sanitation, and hygiene that are most valued by community members, rather than focussing on messages, ideal behaviors, or hardware targets.

5.3.3 Focus on Incremental Improvements in Behavior Change Programs

- Activities to promote behavior change should focus on a small number of high priority behaviors, and should provide practical alternatives within the local context. Promoting a large number of "ideal" behaviors should be avoided.

- Confusion of program goals with educational messages should be avoided. For example, the means to reach the often repeated program goal "Use tubewell water for all purposes" is to focus initially on specific, high-risk, water-related behaviors, and to then build on early successes.

- In order to achieve incremental improvements, programs should be dynamic. As early behavioral objectives are achieved, subsequent high priority behaviors for intervention need to be identified and program activities should be adjusted to address these new priorities.

5.3.4 Monitoring for Program Improvement

- Behavior Change programs should be monitored during implementation. Problems and ineffective interventions should be identified early and program adjustments should be made to address these identified shortcomings. No behavior change intervention will be ideal as initially designed and a system of monitoring and improvement should be devised to improve the intervention during implementation.

- An effective system of problem analysis and solution development is necessary for program improvement. Identifying problems is of little benefit if it does not lead to program improvement. Problem analysis and solution alternatives should be developed with as much community involvement as possible.

5.4 Issues for Further Development and/or Study

5.4.1 Further Refining the SAFE Approach

- The process of defining key behaviors for focussing behavior change interventions needs to be refined. The method used in this pilot project was obviously effective, but this process needs to be simplified and reduced to require less external technical assistance and to be practical within the constraints of smaller community-based NGOs.

- In order to remain relevant, SAFE activities in a community will need to evolve over time. The process of identifying the next layer of behavioral priorities, once initial key behaviors are being successfully addressed, needs to be further developed.

- The combination of quantitative and qualitative information collection was found to be useful in the SAFE Pilot Project, and was an important element of SAFE's success. Based on the SAFE experience, the information collection activities necessary for each step in the project cycle need to be refined and reduced to make the process more accessible and practical for smaller community-based NGOs.

- Repeating the comparison of limited and expanded models of extension may be useful in the future, as elements of the expanded model (particularly male sessions and the role of key community persons) are improved. The relative contribution of each of the various channels of communications needs to be better assessed.

5.4.2 Sustainability of Initial Successes

- The SAFE Pilot Project has demonstrated that hygiene behavior change programs can be successful over the short term, and has provided important information for the development of subsequent hygiene behavior change activities. The sustainability of the early successes described here has not been examined, and is a critical issue for programming in this area.

- The length and evolution of hygiene behavior change interventions needs to be better defined. While initial successes can be achieved in nine months, the length and type of activities that are necessary to sustain early successes and address new problems that emerge needs to be better defined.

- SAFE staff are constantly exposed to health education activities (from various sources) that focus on giving messages, and water and sanitation programs that value hardware targets. Operating in this environment, SAFE field staff may drift towards an emphasis on message delivery and hardware targets. Experimentation and innovation in the internal processes of the SAFE project may be necessary to maintain the unique character of SAFE.

5.4.3 Reproducibility of SAFE Successes

- The SAFE approach needs to be implemented and evaluated in other areas, both to validate the approach in general, and to refine the approach and increase the generalizability of it through broader experience.

- A variety of issues and limitations may be expected to arise as the SAFE project is "scaled up" and as other community-based NGOs attempt to implement similar projects. These issues need to be sought out and solutions developed or limitations defined for the expansion of SAFE activities.

- The SAFE approach was developed for implementation by community-based organizations. The lessons learned from SAFE for other organizations (that are not community-based), such as public sector initiatives in sanitation and hygiene improvement, need to be developed, discussed, and refined.

5.4.4 Cost-effectiveness of the SAFE Approach

- The cost-effectiveness of the SAFE approach needs to be studied and described. An initial, rough calculation (not included in this report) based on the results of the pilot project suggests that the cost per diarrhea episode averted was very small, possibly as little as the cost of two ORS packets. In any event, a more complete cost-effectiveness analysis will aid in the decision of how to most effectively allocate program resources.

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