FIELD REPORT

# BASELINE SURVEY FOR THE GUATEMALAN HIGHLANDS RURAL WATER AND SANITATION PROJECT



WASH Field Report No. 403
August 1993

**WATER AND SANITATION for HEALTH PROJECT**

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# BASELINE SURVEY FOR THE GUATEMALAN HIGHLANDS RURAL WATER AND SANITATION PROJECT

Prepared for the USAID Mission to Guatemala
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by

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and
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# ABOUT THE AUTHORS

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Steven A. Esrey holds a Ph.D. in international nutrition from Cornell University. He has written widely on the topic of health outcomes in relation to water supply and sanitation. His work includes the design and direction of research for USAID/Lesotho's health impact evaluation. He was the principal author and research analyst in the preparation of the Water and Sanitation for Health project's seminal report, Health Benefits from Improvements in Water Supply and Sanitation: Survey and Analysis of the Literature on Selected Diseases. Dr. Esrey is presently on the faculty at McGill University.

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# ACRONYMS AND TERMS USED

| | |
|---|---|
| *aldea* | village |
| ANOVA | analysis of variance |
| *asistente de campo* | field assistant (enumerator) |
| *cantones* | county |
| CARE | CARE International |
| *caserios* | small settlements |
| CHW | community health worker |
| CMR | child mortality rate |
| DHS | demographic health survey |
| *jefatura de Area de Salud* | Departmental Health Headquarters |
| GOG | Government of Guatemala |
| IMR | infant mortality rate |
| INCAP | Institute of Nutrition in Central America and Panama |
| KAP | knowledge, attitudes, and practices |
| MOH | Ministry of Health |
| *molina de nixtamal* | electric maize mill |
| ORS | oral rehydration salts |
| *parajes* | neighborhood, locality |
| PAYSA | Highlands Water and Sanitation Project |
| *salon communal* | community salon |
| SAS/Systat | computer statistical packages |
| SES | socioeconomic status |
| USAID | United States Agency for International Development |
| WASH | Water and Sanitation for Health Project |

# EXECUTIVE SUMMARY

A study was undertaken to establish baseline values for the health impact of the Guatemalan Highlands Rural Water and Sanitation Project (PAYSA). The study was based on a project supported by USAID to bring domestic water, latrines, and health education to 300 villages in the Guatemalan western highlands. Knowledge of hygiene behavior, observations of hygiene practices, and health data were collected from 54 communities. Eighteen of the communities were designated as intervention communities, and 36 were designated as control communities in a 1:2 ratio. Intervention communities were those that will receive the intervention within the next calendar year. Control communities will receive the intervention at the end of the five-year PAYSA project (in mid-1996). Baseline data were collected between January and April of 1993 on 3,250 children—1,279 from the intervention and 1,971 from the control communities.

The data collection instruments were divided into three main sections: socioeconomic status (SES); knowledge, attitudes, and practices (KAP) of mothers regarding diarrhea management; and child health data. The SES section included demographic variables on the household, summary information as to household economic position, and basic data about mothers' social and biological characteristics. The KAP section was based on a simple multidimensional scaling technique operationalized through a combination of open-ended questions, demonstrations by the mothers, and observations by enumerators of household conditions. The preschool child health information consisted of recall data on child morbidity (with a special emphasis on recent diarrheal episodes), anthropometric measurements (height and weight data), and mortality levels.

The results of the survey can be summarized as follows:

- Households visited were mainly poor family farms, generally indigenous, with household heads having little or no formal education. The mean number of persons per household was similar to that found elsewhere in national statistics.
- The health statistics collected were found to be similar to data collected in the late 1980s. The prevalence of diarrhea was less in the baseline survey than in the DHS survey conducted in the late 1980s. The prevalence of diarrhea in the previous 2 weeks was 13 percent, and in the last 24 hours 6.4 percent. For those children with diarrhea, the average episode lasted 5.4 days. About 7 percent of all live births in the previous 4 years resulted in death. The infant mortality rate was 60. As for anthropometry, the rates were very similar to those reported in the Guatemalan demographic health survey with high levels of stunting (70 percent) and of underweight children (47 percent).
- Knowledge and practice rates of appropriate hygiene were low. First, people were unable to identify many causes of diarrhea. Even though many mothers knew about the importance of cleanliness, they were unable to identify many specific measures that could prevent diarrhea. Second, mothers knew about oral rehydration salts (ORS) and its correct use, but they did not always know how to prepare home-made ORS. Third, although observed practices yielded evidence of an unclean environment, in general, both good and bad hygiene practices were found. For example, the majority of mothers kept their homes free of feces, washed their hands, and covered drinking water. However, they did not corral their animals, and they allowed their yards to remain littered with garbage.

- Health outcomes were analyzed in relation to the behavioral, KAP, and SES conditions. Diarrhea and mortality rates were lower in houses where there were higher levels of knowledge of good hygiene practices. This was true for prevalence and duration of diarrheal episodes, infant mortality, and stunting and underweight rates in children. For knowledge of treatment of diarrhea, this was associated only with mortality and nutritional status, not diarrheal morbidity. Observations of the environment (e.g., mother's hands, presence of feces, and protected food and water) indicated that cleaner families had children with better nutritional status, lower child mortality rates (not infant mortality), and a slight reduction in the duration of diarrhea, but no difference in the prevalence of diarrhea.

- The overall comparison of socioeconomic indices, health data, and KAP scores between intervention and control communities showed similarities that will strengthen the interpretation of results for the follow-up evaluation, because differences found will be due most likely to the intervention, not to differences between the comparison groups.

The following key recommendations were made. The mid-term evaluation, scheduled for early 1994, should focus on the process of the health education component and monitoring system, and the final evaluation, to be conducted in 1997, should focus on health impact, allowing for a comparison of mortality rates over a recall period of four years.

## Chapter 1

# INTRODUCTION

## 1.1 Background of the Project

On August 27, 1991, a grant agreement was signed between USAID/Guatemala and the Government of Guatemala (GOG) to carry out a water and sanitation project in the Guatemalan Highlands. The Highlands Water and Sanitation Project, Project No. 520-0399 (PAYSA) is a five-year project designed to achieve a sustained improvement in the health status of the rural poor in the highlands of Guatemala through a 40-percent reduction in diarrhea and a 20-percent reduction in mortality Diarrheal disease is the leading cause of morbidity and mortality among children in Guatemala, accounting for 23.9 percent of all infant death. The Highlands Water and Sanitation Project will offer preventive interventions to interrupt the fecal-oral transmission of diarrhea-causing agents.

To achieve project goals and objectives, 200 potable water systems and 24,000 domestic latrines will be constructed. To complement the provision of water and sanitation activities, a sanitary/health education component will be implemented on a sustainable basis by the communities served. Six hundred community health workers (CHWs) will be trained to provide sanitary/health education messages to their peers on a permanent basis. Institutional health personnel will support the CHWs to ensure that educational messages reach the target audience. Sanitary health education will be provided in Spanish, or in the language or languages spoken by the populations served.

These interventions will be carried out in 300 rural communities (with populations from 200 to 1,200 persons) of six departments of the centralwestern and northwestern regions of the country (Quetzaltenango, San Marcos, Huehuetenango, Quiche, Solola, and Totonicapan). Generally, no health services will be found in these small, remote communities at the beginning of the project. The areas were selected because of the high incidence and prevalence of diarrheal disease, the high rates of child and infant mortality, the high percentage of poor populations, the lack of services, and the interest of the community in project activities.

The combination of these interventions builds on previous USAID project experience and experience with a CARE/Guatemala project that also combines water, sanitation, and hygiene education activities. USAID wanted to employ an ongoing monitoring system developed by CARE to gauge the progress and impact of hygiene education on project beneficiaries. Prior to this current Highlands Project, USAID funded an eight-year rural water and sanitation project that ended in 1988. The Water and Sanitation for Health (WASH) project's final evaluation of that project recommended strengthening the hygiene education component of the program and any follow-on project.

In January, 1992, CARE/Guatemala and USAID/Guatemala requested WASH to design a behavior-based monitoring system for the new CARE/Guatemala rural and sanitation project that

also included a hygiene education component. WASH provided two consultants who designed the system and provided some initial training to CARE staff for implementation. The system was designed to collect data on hygiene behaviors continuously, to allow project designers to make evaluations and take actions immediately in order to improve project delivery and health outcome.

One issue that arose in the initial stages of the assignment was USAID's desire that the CARE project include a baseline survey to measure infant and child morbidity and mortality, which could be compared to a final survey to show health impact. The CARE project had been underway for only two years, an insufficient time period to capture the health impact of water, sanitation, and hygiene education interventions, especially among beneficiaries receiving the intervention late in the project; therefore, the survey was not conducted. In addition, too few communities received the intervention to demonstrate statistical differences in health. The monitoring system, however, would allow CARE to show effective implementation of the project. A progress evaluation of the CARE monitoring system was carried out in late summer 1992, and the findings indicated that the system was improving project delivery.

As a result of WASH's technical assistance to CARE, USAID/Guatemala asked WASH to design a similar system for the Highlands Water and Sanitation Project. However, because the project will span five years, USAID feels it is important to measure child morbidity and mortality as well as hygiene behavior. Therefore, WASH was asked to design a baseline survey that would show statistical significance at mid-term and at project end to demonstrate health impact.

On May 1, 1992, the Office of Procurement requested a Scope of Work that was designed to provide a baseline survey for the USAID/Guatemala Highlands Water and Sanitation Project as a first step to measure health impact. The original project design included measures of diarrheal disease and mortality; however, USAID accepted WASH's suggestion to add anthropometry (weight and height) of children as an additional measure of project impact.

A WASH team made a visit to Guatemala in October 1992 to design the baseline survey (Bergeron and Esrey 1992). The baseline survey was considered essential for documenting the project outputs. The evaluation plan of the project includes baseline, mid-term, and final evaluations. Data were collected with the assistance of the *Instituto de Nutricion de Centro America y Panama* (INCAP), which is based in Guatemala. Development of data collection instruments and selection of data collectors and study sites were carried out during fall 1992. Training of enumerators and data collection and analysis occurred between January and April 1993.

## 1.2 Review of the Literature

Water and sanitation improvements can reduce a variety of disease conditions such as diarrhea, intestinal helminths, guinea worm, and skin diseases; reduce mortality; and improve nutritional status (Esrey et al. 1991). In addition, the ability of water and sanitation improvements to reduce the severity of diseases is perhaps greater than their ability to reduce the incidence or prevalence of diseases. For example, reductions in mortality generally are greater than reductions in morbidity.

It is commonly believed that water and sanitation improve health primarily by interrupting or reducing the transmission of disease agents through raising the quality of drinking water and using more water for better hygiene practices. Other mechanisms include a time savings that could result in the preparation of more food for children, an increase in caloric intake, and greater economic productivity (Berger and Esrey 1993). Also, with less disease, children might eat more food, thereby improving their nutritional status.

### 1.2.1 Water and Health

Improvements in water supply can result in health benefits. Improvements in the quality of drinking water can reduce ingestion of pathogens, which is expected to improve health to a large extent. However, the results are mixed, and when benefits occur, the improvements in health are small (Esrey et al. 1991). A second type of improvement is an increase in the availability of water for better personal and domestic hygiene practices (e.g., hand washing, food washing, and household cleaning). Population groups that consistently use more water have better health than groups that use less water, and the benefits to health are much larger than the benefits from improved drinking water quality. This has been shown repeatedly for several health outcomes, such as specific diarrheal pathogens, diarrheal morbidity, and child growth. A third type of improvement is the use of more water for income generating (e.g., local industries) or food producing (e.g., gardening) activities. Both of these improvements could result in the intake of more food, improving child anthropometry. A fourth type of improvement is a reduction in the time spent drawing water. Studies suggest that when women have more time for other activities, they spend much of that time in food-related activities, such as preparing food and feeding young children (Berger and Esrey 1993). More time also can lead to better child care and can increase opportunities for income generating activities. Although these improvements are thought to be of benefit, little documentation has been provided in the literature. Lastly, when water is provided to the premises, as will be done in the PAYSA project, reductions in diarrhea and increases in a child's body size can be substantial (Esrey 1993b).

### 1.2.2 Sanitation and Health

Improvements in sanitation have been shown consistently to result in better health, as measured by less diarrhea, reductions in parasitic infections, increased child growth, and lower mortality. The expected reductions in mortality can be substantial, particularly in areas with low levels of education (Esrey and Habicht 1988). Modest improvements in sanitation, such as pit latrines, will result in better health, but major improvements in sanitation, such as flush toilets, will result in even larger health benefits (Anker and Knowles 1980; Esrey 1993). Recently in Guatemala, the prevalence of stunting (relative shortness in height) was significantly less when adequate sanitation was available (Bateman and Smith 1991). This nutritional benefit also occurred in individuals without adequate sanitation, in communities where most people had adequate sanitation.

### 1.2.3 Hygiene Behavior and Health

Improvements in water or sanitation will not automatically result in improvements in health. Often, the addition of hygiene education is required to ensure health impacts. The messages necessary to impart are not well known, but basic messages regarding hand washing, proper disposal of feces and garbage, and protection of the environment are thought to be essential. Several studies in different parts of the world, in daycare centers, and in community settings, have indicated that frequent hand washing, with and without soap, results in less diarrhea. Collectively, these studies report a 33 percent reduction in diarrhea. One study in Guatemala reported a reduction of 17 percent as a result of improved personal hygiene (Torun 1982). Some of the studies have examined differences in hygiene rather than changes in hygiene. In the Guatemalan Highlands, hygiene education may not reduce diarrhea to the same extent, but nonetheless reductions should occur. Health education messages have been operationalized in the PAYSA Project, and the baseline survey, described below, has measured many of these practices.

All of the above mechanisms are summarized in Figure 1. Improvements in water, sanitation, and hygiene education are expected to reduce the burdens of disease and improve the overall health of people. Reductions in morbidity, such as diarrhea, would improve nutritional status by a reduction in dehydration, fever, and malabsorption of nutrients. In turn, improvements in nutritional status would decrease rates of severe diarrhea (e.g., shorter duration). Reductions in diarrhea and malnutrition would lead to a reduction in mortality.

Evidence from past studies indicates that improvements in water and sanitation facilities can reduce diarrheal diseases by 26 percent (Esrey et al. 1991). The range of reductions from many studies varies widely, from no reduction to nearly 100 percent reduction. Although this range can be attributed in part to poorly designed studies, it also can be explained by the type of service installed. For example, improvements in personal hygiene can reduce diarrhea by an average of 33 percent, sanitation improvements by 36 percent, increased water quality by 15 percent, and water quantity by 20 percent. Recently in Guatemala, improvements in the protection of drinking water were reported to decrease diarrhea (Hurtado, personal communication).

Although the effects of single interventions cannot necessarily be added when interventions are combined, as is the case in the Highlands Project, it can be assumed that greater effects can be achieved when interventions are combined. For example, if the expected reduction for better drinking water quality is 15 percent and that for sanitation 36 percent (Esrey et al. 1991), it might be expected that at least a 36 percent reduction in diarrheal diseases could be achieved. More accurate predictions are difficult. In some cases reductions are not additive, in others they are, and in still others, reductions are greater than the addition of each individual reduction.

Reductions in mortality can be expected to be greater than reductions in incidence or prevalence of diarrhea in areas with high levels of fecal contamination, because reductions in disease severity would occur before a reduction in disease incidence (Esrey et al. 1985). This would be true if the dose of ingested pathogens is reduced enough to produce a mild episode of diarrhea instead of a severe episode. Three studies report a median reduction in diarrheal mortality of 65 percent, which exceeds the figures for morbidity. Such large reductions may not be seen in Guatemala, but greater reductions in mortality would be expected than for morbidity. Not only are mortality

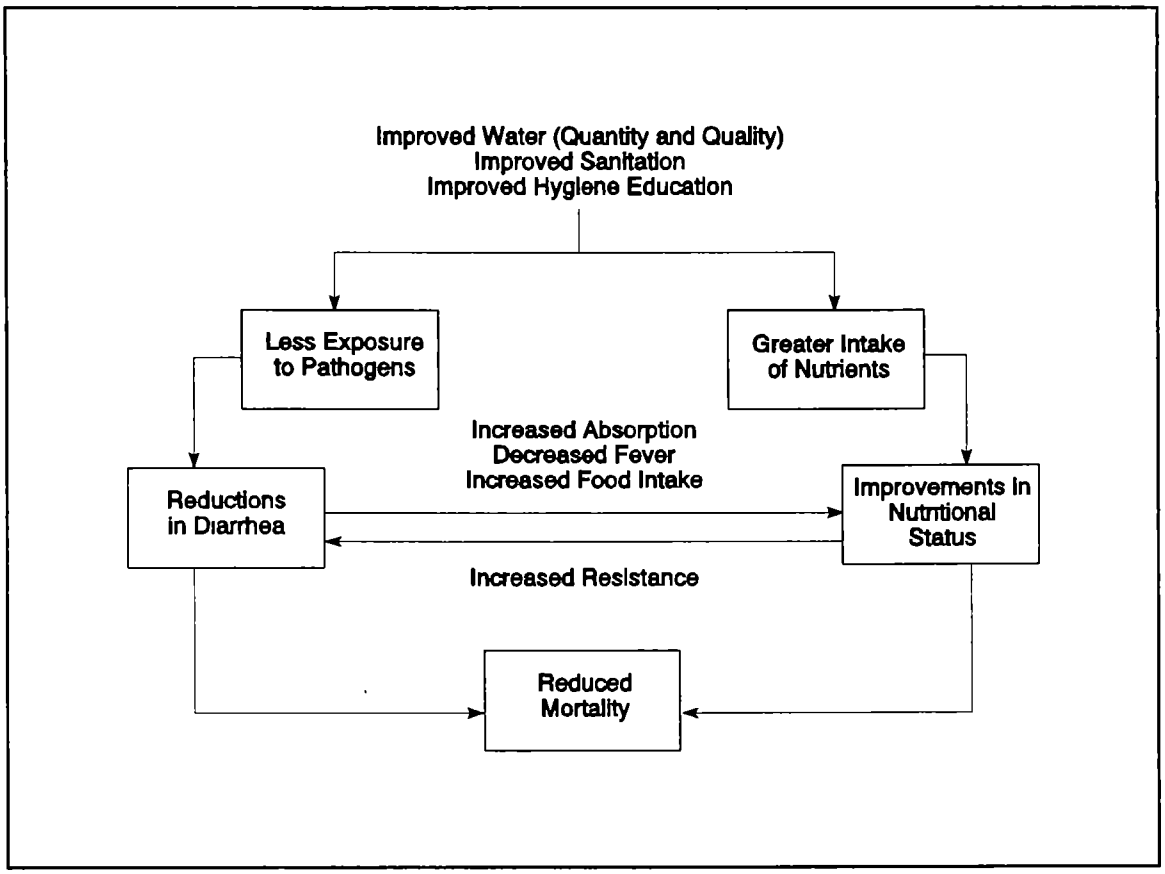


**Figure 1: Mechanism Whereby Improved Water, Sanitation, and Hygiene Benefit Health**

reductions reported to be greater than morbidity reductions for diarrhea, but for other diseases the severity of the disease or infection is usually reduced more than the incidence. For example, egg counts for ascaris, hookworm, and schistosomiasis are reduced more than the prevalence of infection from these parasites when water and sanitation conditions are improved (Esrey et al. 1991).

A number of studies also report improvements in nutritional status following improvements in water and sanitation. Increases in weight (several hundred grams) and height (about 1 cm) consistently have been reported. Nutritional status is probably a better measure of improvements in water and sanitation than diarrhea. Improvements in nutritional status also can occur independently from reductions in diarrhea. Reductions in other childhood diseases such as ascariasis, which is widespread in the Guatemalan Highlands, also lead to improved nutritional status. Other benefits of the water and sanitation project include bringing water closer to people's homes, allowing women more time to prepare food and feed their children. These benefits have been reported from other settings in the world. Thus, weights and heights of children would likely improve independently of reductions in other diseases, such as diarrhea. In summary,

multiple benefits that accrue from the Highlands Project may best be measured by heights and weights of children.

On the basis of the above review, it is realistic to expect reductions in diarrhea, improvements in nutritional status, and reductions in mortality. For diarrhea, the expected reductions in diarrhea incidence or prevalence may be up to 36 percent, as discussed above. A 20 percent reduction in mortality due to diarrhea and in overall child mortality should be achieved. Improvements in nutritional status, reflected in average height increases of 1 cm and average weight increases of 300 grams would also be expected. Although the stated health objectives are to reduce diarrheal disease rates and increase child survival, the study will also measure the nutritional status of preschool children.

## 1.3 Objectives of the Baseline Survey

The project goal is to create a sustained improvement in the health status of the rural poor in the target area, particularly infants and young children. The project will be measured in terms of the reduction of gastrointestinal disease incidence (20 percent), particularly among children between birth and five years of age, and reductions in mortality levels among these age groups (40 percent). In addition, child anthropometry will be measured to evaluate a comprehensive benefit from the project. In addition to the provision of water and sanitation, a specific set of educational objectives was specified by the project in order to attain the stated health objectives. These objectives are outlined below.

### 1.3.1 Latrines

- Ninety percent of the families with latrines will use them correctly, maintain them appropriately, and keep them covered.
- Seventy-five percent of children from three to five years of age will be trained to use latrines properly.*

### 1.3.2 Water

- Eighty percent of the families that have a tap will obtain drinking water directly from the tap or from a clean, covered container.
- Eighty percent of the families that do not have a tap will carry and store drinking water in a clean, covered container.

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* This indicator was not included in the baseline survey because preliminary field trials showed a wide variation in the concept of "proper" latrine use by children under five. Because of limited interview time, this question was replaced by question C14, a much more general one.

- Eighty percent of the target population will wash their hands with soap before preparing food and feeding children.
- Eighty percent of the population three years of age and older will wash their hands with soap after using the latrine.

### 1.3.3 Waste/Environment

- Eighty percent of the families will bury animal feces and biodegradable garbage.
- Eighty percent of the families having pigs, cows, or sheep will keep them tied up or in stockyards.

### 1.3.4 Health Knowledge

- Eighty percent of the adult population (older than 15 years of age) will be able to identify what contamination is.
- Eighty percent of the adult population will be able to identify three causes of diarrhea.

### 1.3.5 Environment

- Eighty percent of the adult population will be able to recognize the importance of protecting and conserving the watershed.
- Eighty percent of the adult population will recognize the importance of the appropriate use of pesticides and the need for forestation near the watershed.

## Chapter 2

# METHODS

## 2.1 Study Design

The design called for an "intervention" and a "control" group of communities. Although none of the villages had improved water supplies, sanitation services, or hygiene education at the time of the baseline survey, communities will be referred to separately as intervention and control communities. Intervention communities are those designated to receive the intervention. Control communities refer to communities that are scheduled to receive the intervention only at the end of the five-year project and after completion of the follow-up survey. Each of the groups will be measured at baseline and at the final evaluation. This is shown in Figure 2. The Mission will conduct a mid-term process evaluation emphasizing the health education component.

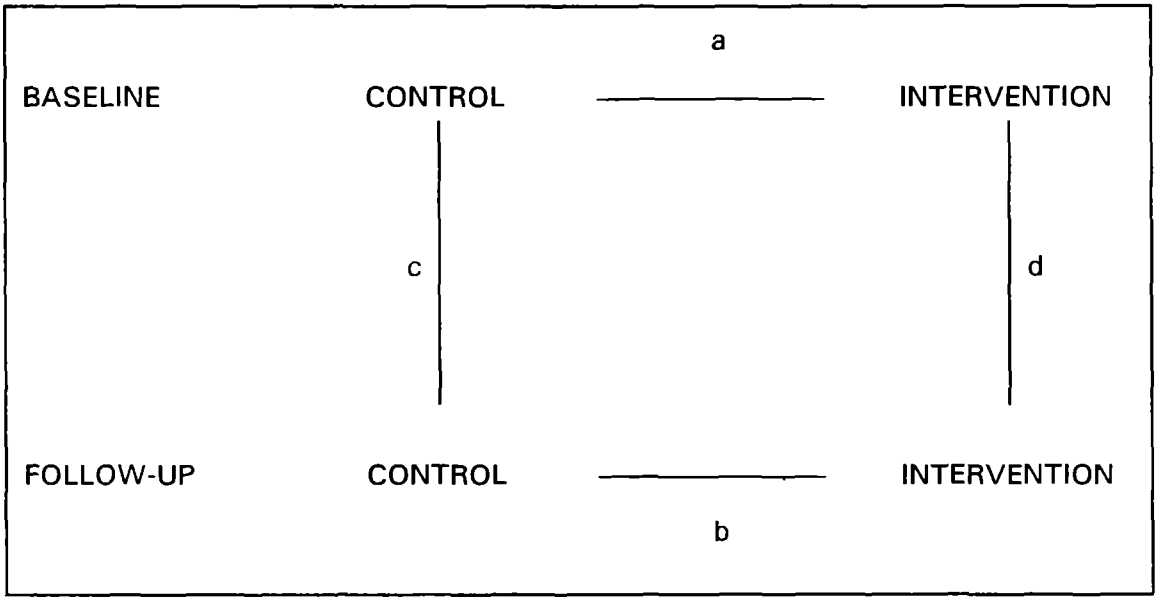


**Figure 2: Study Design Scheme for Baseline and Follow-Up Surveys**

This type of design will permit the following four comparisons to be made (the letters below refer to the letters in Figure 2):

a. At baseline, the intervention and control communities can be compared. No differences are expected because they all come from the same population and nothing distinguishes one community from the other (i.e., no intervention took place).

b. At follow-up, the intervention and control communities can be compared. Differences will be expected, which can be attributed to the effect of the intervention.

c. Control communities will be compared over time from baseline to follow-up. No differences will be expected because no intervention is expected to take place.

d. Intervention communities will be compared over time from baseline to follow-up. Differences will be expected, and they can be attributed to the effect of the intervention.

Such a design (i.e., intervention and control communities), which includes baseline and follow-up measurements, will allow the analysts to control for any changes occurring over time. Communities do not remain static. People gain access to new information, receive interventions from outside the project, and are subject to influences beyond their control that affect their health. Thus, changes in health from one year to the next are as likely to be due to the PAYSA intervention, as to influences outside the scope of the project. External influences on health can be estimated and removed from the total change in health by including a control group. In this case, communities that are comparable to the intervention communities in all respects except the intervention would serve as an appropriate control group. Thus, the inclusion of the control group will allow the change due to the intervention to be estimated more precisely.

## 2.2 Sampling

### 2.2.1 Sample Size

Because of the possibility of control communities receiving interventions (whether or not they are similar to PAYSA's intervention) from external agencies and the possibility of cluster effects, a 2:1 sampling ratio was used. That is, two control communities were selected for every intervention community. Because of the number of people in these communities, we also anticipated measuring an average of 60 children per community. For sample size calculations for differences in diarrhea prevalence (24-hour or 14-day recall) or reductions in mortality, the following formula was used:

$$N_c = \sqrt{\frac{(Z_\alpha + Z_\beta) * 2}{(\sin^{-1} * \sqrt{P_c} - \sin^{-1} * \sqrt{P_t})^2}}$$

where,

$N_c$ = number of children in control group, $Z_\alpha$ = 1.96 (chance of Type I error = 5 percent), $Z_\beta$ = 1.285 (power = 80 percent), 2 = constant for the comparison of the two groups, $\sin^{-1}$ = arcsine expressed as radians, $P_c$ = prevalence in control group, and $P_t$ = prevalence in control group.

With 80-percent power, a 30-percent reduction in diarrhea prevalence can be measured assuming a control community rate of diarrhea of 14 percent. For mortality, a 40-percent reduction can be measured with statistical significance, assuming a mortality rate of 75 deaths per 1,000 live births.

The sample size formula used for nutritional anthropometry (e.g., height-for-age) also considered an independent two-sample t-test.

$$N_c = \sqrt{\frac{(Z_\alpha + Z_\beta)^2 * 2}{\delta^2}}$$

where,

$N_c$ = number of children in control group, $Z_\alpha$ = 1.96 (chance of Type I error = 5 percent), $Z_\beta$ = 1.285 (power = 80 percent), 2 = constant for the comparison of 2 groups, and $\delta$ = expected difference between control and intervention groups.

This results in 80-percent power to detect a 0.2 Z-score difference in height-for-age. The overall sample was designed to include 51 communities—34 control and 17 intervention—keeping the 2:1 ratio. From these communities, it was anticipated that an average of 60 children five years of age or less would be sampled, and the target number of 3,000 children would be available for analysis.

### 2.2.2 Sample Selection Criteria

As mentioned above, the sample was to be divided between intervention and control communities. Intervention villages were to be selected from PAYSA's lists of intervention communities. Three additional criteria were used to select communities for inclusion in the baseline survey:

- PAYSA would start work in these communities after baseline data were collected to ensure that no component of the intervention would change the knowledge, attitudes, and practices of the people surveyed.
- PAYSA would complete the installation of the water and sanitation system in the community before December 31, 1993, to ensure that all intervention villages would have similar exposure time to the "treatment" before the follow-up study and to allow them sufficient exposure time to adopt the intervention and for it to produce changes in health.
- The communities had to be either Quiche-, Mam-, or Spanish-speaking. This criterion was meant to facilitate fieldwork. In addition to Spanish, 22 Mayan languages are spoken in the country. Four of these, Quiche, Mam, Kekchi, and Kaqchikel, account for approximately 80 percent of the indigenous population. By concentrating on the Quiche and Mam languages, we could retain maximum geographical coverage while restricting the search for enumerators to two ethnic groups.

The control villages were selected on the basis of their comparability with the intervention communities. Because of the wide variability existing among intervention communities, control communities were matched with intervention communities as closely as possible. Criteria used for the selection of control communities are listed in order of importance:

- physical proximity to the intervention community
- common ethnic identity
- similar climate and altitude
- similar agricultural production processes
- relatively equal distance to important rural centers
- similar accessibility (road conditions)
- similar types of water supply
- similar population

The list of communities appears in Appendix 2 along with the number of children sampled in each community.

## 2.3 Variables to Be Measured

The purposes of the baseline survey were to assess the health-related knowledge, attitudes, and practices (KAP) of people interviewed; to identify the most pressing health education messages for PAYSA to implement; and to determine health characteristics. The questionnaire, therefore, included four categories of information:

- socioeconomic and demographic data
- knowledge and attitude of self-reported health-related practices
- observational data related to knowledge and attitude of health-related practices
- child anthropometric data coupled with morbidity and mortality data

This section presents each of the four categories in more detail.

### 2.3.1 Socioeconomic/Demographic Data

Collecting socioeconomic and demographic data served a twin purpose: to assess the comparability of the designated intervention and control communities, and to remove any influence from confounding factors such as household wealth, mother's biological characteristics, or climatic extremes by controlling for these factors in later analyses. The questions used to obtain family level socioeconomic and demographic data can be found in question numbers

A01-A26 (Appendix 3). A separate form was used to collect basic community information (Appendix 4). Briefly, some of the major variables that were collected are listed below.

- Community characteristics
  - number of families
  - number of nuclear families
  - language spoken
  - ethnic identity
  - type of community (intervention or control)
  - proximity to the road
  - proximity of control and intervention communities to each other
  - main type of community activity (e.g., agriculture)
  - climate
  - altitude
- Household characteristics
  - quality of house construction
  - number of rooms
  - access to water
  - access to electricity
  - number of domestic goods possessed
  - total number of people in the home
  - number of children under five currently living in the home
- Household head
  - age of household head
  - primary occupation of household head
  - secondary occupation of household head

- Mothers of children less than five years of age
- marital status
- relationship to household head
- age
- primary occupation
- secondary occupation
- level of schooling
- parity

### 2.3.2 Knowledge and Attitude Data

Data pertaining to self-reported knowledge and attitudes of health-related practices are in section B01-B26 of the questionnaire. The knowledge and attitude data were operationalized around three general interest areas based on PAYSA's health education messages (to be taught to mothers by volunteers). The three areas were prevention of diarrhea, treatment of diarrhea, and garbage disposal and environmental awareness. These data were complemented by having mothers demonstrate hand washing and dish washing techniques. Finally, the level of activity displayed by local health agents was assessed by asking respondents the frequency and content of interventions they had been exposed to in the past by health agents. The detailed content of each interest area is presented in Appendix 2.

Two basic approaches were considered to collect data on people's knowledge and attitudes about health-related practices. In the first approach, respondents are asked what they think about a particular issue, and they are free to answer whatever they think is relevant (open-ended response). For instance, the question may be phrased, "What causes diarrhea?" A set of acceptable answers is pre-coded on the questionnaire, and every correct answer given by the respondent is checked on the form. If the respondent says dirty water, or some comparable response, this response will be checked on the questionnaire. The sum of correct answers provided by the respondent is then compiled to create a score. The second approach is to present respondents with a particular statement about each issue of interest and ask how strongly the respondent feels about that statement. The answer is then scaled from "totally disagree" to "totally agree," with one or more options in between these extremes. For instance, the question "How strongly do you feel about dirty water causing diarrhea in young children?" could be asked.

There are advantages and disadvantages with both approaches. The advantage of the open-ended approach over the scaled approach is that the former asks the question without providing knowledge of a correct answer, while the latter approach provides knowledge in the phrasing of the question. When obtaining data on knowledge and attitudes, it is inappropriate to provide knowledge in the question format.

In the open-ended approach, the biggest problem is inter-respondent variation as a result of personal characteristics (differential reporting). For instance, outspoken respondents are likely to provide a higher number of correct answers relative to timid respondents simply because they are more talkative. Timid respondents may only offer one of several possible answers. This is not a problem at the aggregate level because tendencies cancel each other out at the level of the group. If the same situation occurs in two comparison groups, no bias would occur when they are compared. Differential reporting may be a problem when analyzing data at the household or child level. For instance, when relating KAP scores with morbidity data in household-based analyses, the results may be spurious. This potential problem can be minimized through the proper training of enumerators, the adoption of non-intimidating probing techniques, and making sure that all of the respondents' knowledge has been tapped before going to the next question. For instance, after one response has been given, the interviewer could ask, "Can you think of something else?"

In the second, scaled approach, the biggest problem is time. One has to define every component of a specific dimension, articulate a statement around it, and ask the respondents how they feel about the statement. This approach is costly in interviewing time. Another problem with this second approach is that many statements are difficult to articulate in a neutral manner. For reasons of time, and because we felt we could manage the problems associated with the open-ended approach better than those of the scaled approach, we decided to take an open-ended approach. Enumerators received the proper training to deal with the difficulties associated with the open-ended approach.

Using an open-ended approach to collect knowledge-related data means that single items are not tested individually. What is being tested is the general level of knowledge of the respondent over the domain of interest. (See Appendix 5 for more details.) For example, the causes of diarrhea are many. Respondents may not identify all possible causes that are precoded, but they may know many other causes. Thus, a comparison of those with and those without knowledge of a specific cause of diarrhea may not be very insightful. However, the more correct items respondents mention, the greater their knowledge. This principle forms the basis for creating an index score in particular areas of interest. Accordingly, the results below will compare groups with more knowledge (higher score on the index) to groups with less knowledge (lower score on the index).

### 2.3.3 Observation Data

Observations of household sanitation conditions were made to complement the self-reported knowledge and attitude data. This information is contained in questions numbered C01-C26. The areas of interest were whether food and drinking water were adequately covered; whether the floors of the house and the patio were free of feces, garbage, and mudholes; whether animals were kept outside the home and whether they were corralled or tethered; whether the mother's hands were clean; and whether dishes were clean. In addition, when a latrine was present, the conditions in which the household latrine was found, who used it, the quality of its construction, and the quality of its maintenance were observed. Finally, the source of drinking water was described and characterized. The data were recorded directly by the enumerator who toured the

home including the kitchen, other rooms, the latrine, and the patio. The respondents were asked only about the source of drinking water and which household members had used the latrine. Observations were coded in dichotomous (yes or no) form that specified whether or not a correct practice had been observed. Indices were formed from the total number of observations for general household cleanliness, quality of latrine construction, and quality of domestic water supply. The full list of observations made is presented in Appendix 3.

### 2.3.4 Child Health Data

Health data, including height, weight, and diarrhea and respiratory episodes were collected on all children five years of age or younger. In addition, child mortality data were obtained from mothers. The information on child morbidity and anthropometry is located in questions D01-D32. Data for mortality recall are in questions AA01-AA12.

Specific questions were asked about diarrhea and respiratory diseases. First, a two-week recall was used to assess morbidity for each child five years of age or younger. For gastrointestinal and respiratory diseases, the day the child became affected and the length of the episode (number of days) also were obtained. The severity of the symptoms that manifested during the episode was also recorded. For diarrhea, this included mucus and blood in the stools, fever, vomiting, and respiratory episodes such as cough, difficult breathing, and fever. Data were expressed as period (14-day recall) and point prevalence (24-hour recall) and average duration (number of days). Since ongoing episodes were truncated to the day of the interview and episodes that started 15 days before the interview also were truncated to 15 days prior to the interview, the duration of episodes is likely to be slightly under-reported. For each type of condition, the morbidity data were later transformed to show duration (total number of days the child suffered from the disease) and prevalence (a dichotomous variable indicating whether or not the child had been sick over the last two weeks).

Information about other infectious diseases also was recorded. (See list in Appendix 3.) Finally, information about the immunization history of the child was collected (but only when the mother could produce the child immunization booklet). If no booklet was viewed, either because it was non-existent or had been lost, immunization variables were coded as missing.

The weight and stature of every child under five in the household were recorded, along with each child's gender and age (in months). This served as a basis for computing Z-scores for weight-for-age, height-for-age, and weight-for-height. Salter scales with a precision level to the tenth of a kilogram were used. Scales were kept in good working condition and recalibrated once each week for the duration of field activity. Enumerators first weighed the child with clothes on, then asked the mother to provide similar clothes to be weighed separately. The child's true weight was obtained by subtracting the latter from the former. Standard measuring boards were used to measure height. Children over 24 months of age were measured standing, while children under that age were measured in a supine position. To be measured for anthropometry, the child had to be younger than five years of age as of January 1, 1993. Clinical signs of malnutrition (e.g., edema) were also observed and coded. The cumulative reduction in incidence and severity of

multiple illnesses that is due to water and sanitation improvements is measurable in the weights and heights of children. In addition, other mechanisms that improve children's nutritional status, independent of a reduction in illness, also would be measured by improvements in nutritional status.

Mortality was assessed by asking every mother how many children under five years of age had died over the previous four years and the age of the child (in months) when he or she died. No questions were asked about the cause of death, as this information is typically unreliable in the absence of medical reports. Mortality rate can be defined as infant, 1-5, or child. The objective of the baseline survey was to provide for the number of deaths in a four-year period so the follow-up evaluation had a point of comparison. Thus, the method used in this survey is internally reliable as an evaluation method, but it is difficult to compare the death rates calculated in this survey to standardized mortality rates reported in other documents.

The calculations, along with the terms that will be used throughout this report can be summarized as follows:

$$\text{Infant mortality rate (IMR)} = \frac{\text{all deaths (0-11 months of age)}}{\text{all children in survey} + \text{all infant deaths}}$$

$$\text{1-5 mortality rate} = \frac{\text{all deaths (12-60 months of age)}}{\text{all children in survey} > \text{12 months of age} + \text{all deaths (12-60 months of age)}}$$

$$\text{Child mortality rate (CMR)} = \frac{\text{all deaths (0-60 months of age)}}{\text{all children in survey} + \text{all deaths}}$$

The rationale for these calculations can be shown in Figure 3.

The first child lived through the first five years of life and would be included in the denominator for all calculations. The second child died in infancy and would be included in the denominator for infant and total deaths but not in child death calculations. The third child died some time between the ages of 12 and 60 months and would be included in all three calculations. The fourth child is alive under 12 months of age at the time of the survey and would be included in infant and total calculations but not in child calculations. The fifth child is alive and is between 12 and 60 months old. The majority of the sample fits this description. These children are included in all calculations. Because some children in this cohort will die before their fifth birthday, the estimate of total mortality will be lower than what would be calculated after all children had an opportunity to complete this period of life. A problem with the calculated death rates on a yearly basis is that the year of death (e.g., 1991) is not known, only the age of the child in months when

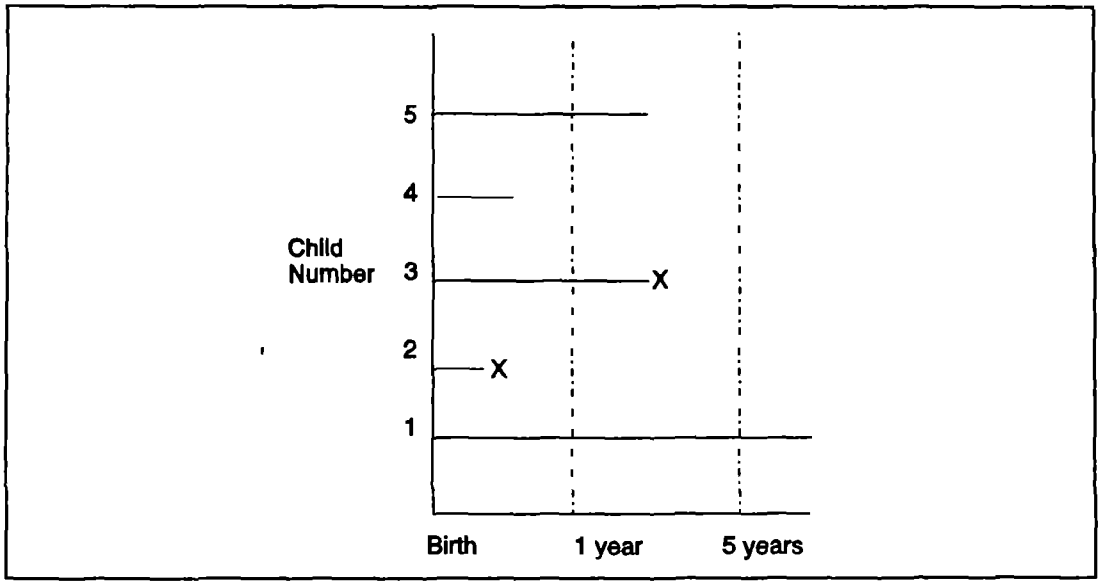


**Figure 3: Determination of Denominators for Calculations of Mortality Rates**

he or she died; therefore, mortality rates for individual years cannot be calculated. This is not a major issue, however, because the follow-up survey will assess mortality in the previous four years.

## 2.4 Data Management

### 2.4.1 Data Collection Procedures

#### 2.4.1.1 Enumerator Selection and Training

Enumerators hired to carry out the study have to meet the requirements set by INCAP for the position of field assistant (*asistente de campo*). Field assistants must have a preliminary school teaching diploma (or equivalent), no penal or judicial files, and no pending problems related to previous work with INCAP. In addition, they had to speak Spanish and either Quiche or Mam, the two languages found among sampled populations. Then, on the basis of language skills, enumerators were assigned to one of the two work teams.

Enumerators' training took place from January 4 to 28, 1993. The first week of training was spent reviewing and preparing for the socioeconomic, demographic, and KAP survey. The second week was spent preparing for anthropometric measurements (theory, practice, and inter-enumerator standardization), and the third week was spent doing simulations in the field, each day successively integrating additional components of the complete survey. At the end of the training period, the average time spent in a household completing the questionnaire was 30 minutes.

#### 2.4.1.2 Fieldwork Process

One month before starting fieldwork, the in-country project director visited most villages included in the sample. The only villages where his visit was not deemed necessary were those in which PAYSA already had established strong ties with community leaders. Meetings were arranged with village leaders in which the field director informed them of the nature of the study and requested their collaboration. Letters were later exchanged between parties to formalize the agreements reached and establish approximate dates of visits.

The fieldwork took place from February 1 to April 16, 1993. Two teams, each composed of five enumerators, worked Monday through Friday. Work teams traveled daily from the nearest town to the work site in vehicles provided by INCAP, except in a few cases where a community's remoteness demanded that the teams stay overnight. Each team had one field supervisor, who was responsible for the following tasks:

- establishing contact with key people in the village visited
- requesting permission for doing the survey
- deciding on a sampling frame given the number of households to be visited and the total number of households in the community
- dividing the area equally among the enumerators and assigning one work area per day to each enumerator
- reviewing every questionnaire form administered by the enumerators for consistency and accuracy

The supervisor also had to administer the Community Profile questionnaire to one community official during the time of the visit and make sure forms were sent to INCAP once a week for processing. In addition, the supervisor maintained employee relations, made sure that necessary supplies were available, and kept records of hours worked, mileage accrued, and expenses incurred. Both field supervisors reported directly to the project director once a week.

### 2.4.2 Coding, Cleaning, and Entry of Data

The questionnaires were designed to permit quick coding during the interview and clean coding in the far right column. Individual enumerators recorded clean coding at the end of the day after finishing all interviews. Then, enumerators exchanged forms to check each other's accuracy. Next, each form was reviewed by the supervisor, who checked for consistency and standardization. The in-country project director also reviewed approximately 40 percent of the forms before they went to data entry. For more detail regarding the interpretation and coding of the questionnaire, see the enumerator manual.

Data were entered daily into a computer. Once a week, after the coding checks described above were performed, forms were sent to INCAP's microcomputer center in Guatemala. All the data were entered twice, and both files were compared for typing errors. Range checks also were built

into the data entry program to avoid entering values, thus ensuring the internal consistency of the data set from the start. Later, external consistency checks were made using SAS programs. Forms and data files will be maintained at INCAP for 10 years after data collection. In the case of this study, which will be replicated once in the next five years, keeping the baseline survey forms will save time because questionnaire design, data entry programs, and checking/validating programs already have been developed. Some questions relevant only to the follow-up survey have been incorporated into the baseline survey form.

### 2.4.3 Data Analysis Procedures

Data were analyzed using SAS and SYSTAT on a personal computer. Procedures used included simple descriptive statistics (frequencies, cross-tabulations, and correlations) and statistical testing of hypotheses (t-test and ANOVA), and statistical significance was determined at levels of $p \leq 0.05$. Essential results of statistical analyses are reported in selected tables in Chapter 3.

## Chapter 3

# RESULTS

This section is divided in six sub-sections that describe the following: the region, communities, and families visited; socioeconomic and demographic data; health outcome variables (morbidity, anthropometry, and mortality); KAP data, with general findings and recommendations; observational data; and indices created from the KAP data and their association with health outcomes.

## 3.1 Description of Region/Villages

The study took place in the Western Highlands of Guatemala, in the departments of Quiche, Quezaltenango, San Marcos, Huehuetenango, Totonicapan, and Solola, all of which have a high percentage of indigenous people. (See Appendix 2 for name and location of villages along with basic information.) Because of altitude variations in this mountainous region, its climate ranges from cold to temperate to hot. The people living in these areas are mainly agriculturists, a large number of whom also migrate seasonally to the large farms of the Pacific Coast or of Southern Mexico to find work. Because seasonal migration placed some constraints on the timing of the study, the sequence of visits was devised so that we could visit each village in its period of least migration within the timetable of the fieldwork.

All communities we visited were located in areas of moderate to difficult access, where development efforts are still in their infancy. (There are more remote communities in Guatemala, such as in northern Quiche and Alta Verapaz, and those probably have even less infrastructure than those we visited.) The list of villages selected for the study appears in Appendix 2, with basic data on sampled population and language. Administratively, these villages are either *aldeas* or sections of *aldeas*. (They are then called either *cantones, caserios,* or *parajes* ) Development levels in all of them were low, although variations existed at the level of electrical supply, type of water supply, quality of road access, and presence of community infrastructure (such as *salon communal*, or *molino de nixtamal*).

The present section describes the social, economic, and demographic characteristics of the sample, by intervention and control communities. This is done to describe the communities and to assess the validity of comparing intervention and control communities with the baseline data following change due to the intervention.

An average of 35 families per village were included in the survey (Table 1). For the control group, about 32 families were visited in each village; whereas in the intervention group an average of 40 families were visited. This resulted in a control to intervention ratio of families of 1 6. The actual number of families visited per village varied from a low of 15 to a high of 105. A total of 3,250 children were measured, with a ratio of 1.5 for control to intervention

**Table 1: Community Characteristics among 54 Communities in the Baseline Survey**

| | Type of Community | | |
|---|---|---|---|
| Characteristic | Control | Intervention | Total |
| Communities surveyed | 36 | 18 | 54 |
| Families visited | 1,152 | 710 | 1,862 |
| Children measured | 1,971 | 1,297 | 3,250 |
| Mam-speaking interviews | 1.7% | 2.4% | 4.1% |
| Quiche-speaking interviews | 16.7% | 15.6% | 32.3% |
| Spanish-speaking interviews | 43.5% | 20.1% | 63.6% |

communities. In the control communities 1.7 children, five years of age or younger, were found per family. The corresponding figure in the intervention communities was 1.8. These ratios are less than the anticipated ratio of 2:1. Without guaranteeing immediate services (e.g., a household water supply), the control population proved less willing to cooperate than those in the intervention communities. This reluctance explains the lower participation rate of respondents in control communities.

## 3.2 Socioeconomic Characteristics of Sample

Across the sample, living conditions were overwhelmingly poor (Table 2). Because of climatic and cultural reasons, residential quarters did present differences from community to community. The materials used for house construction were generally adobe or lesser materials for walls, and zinc or lesser materials for roofing. The floors in most homes were earth. Half of the sample had only one room, but three-quarters had an additional space used as a separate kitchen. Few had electricity or a vehicle, but two-thirds had a radio. Half had a large animal (e.g., horse or mule). Most respondents were married or living with a male partner. The majority of women could not read.

When comparing village types, we found few differences between those in the intervention and control communities. If any trend emerged, the control community may have been slightly better off than the intervention communities. The control communities had more literate mothers and better floors in the home, but they also had larger families. In every other respect, the comparison communities were similar.

The families visited were mainly farming households, approximately 70 percent of them declaring family agriculture as their main income earning strategy and most others declaring it as secondary activity. The majority of families were engaged in subsistence agriculture, but a few were

**Table 2: Socioeconomic and Demographic Characteristics of the Baseline Sample by Intervention and Control Communities**

| | Type of Community | | |
|---|---|---|---|
| Characteristic | Control n = 1,152 | Intervention n = 710 | Total n = 1,862 |
| Mothers who can read* | 34.0% | 24.7% | 30.5% |
| Households with electricity | 13.7% | 12.0% | 13.1% |
| Percent with dirt floor* | 77.2% | 83.8% | 79.7% |
| Percent with adobe, wattle, or straw walls | 84.1% | 82.5% | 83.5% |
| Percent with zinc, tile, or straw roof | 98.7% | 98.5% | 98.6% |
| Percent with one room | 50.5% | 51.8% | 51.0% |
| Percent with a bicycle | 11.8% | 10.0% | 11.1% |
| Percent with large animals* | 55.0% | 50.0% | 53.1% |
| Percent of respondents married or in union | 95.1% | 96.6% | 95.7% |
| Percent living with other families | 25.8% | 24.5% | 25.3% |
| Percent with radio | 66.4% | 65.9% | 66.2% |
| Percent of household with one child < five years | 37.8% | 39.7% | 38.5% |
| Percent of household with more than eight people* | 44.1% | 38.3% | 41.9% |
| Percent with separate kitchen | 74.1% | 76.8% | 75.1% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

commercial farmers, and these were concentrated in one or two communities. The other most important categories of occupation were specialized work (6.5 percent), artisan industries (5.5 percent), and agricultural day labor (4.8 percent).

In conclusion, the baseline sample is representative of the Highland population. They are poor with little education. In addition, the intervention and control communities are comparable for the socioeconomic status (SES) indicators. This suggests that the perceived lack of cooperation among control communities relative to intervention communities did not generate different types of samples. Thus, for changes due to the intervention (i.e., follow-up versus baseline values),

PAYSA should feel confident that this can be estimated without worrying that the comparison groups are different.

## 3.3 Health Outcomes

The four outcome indicators that were measured were diarrheal and respiratory morbidity, anthropometry, and mortality of children less than five years. This section provides a detailed review of findings for each of these indicators in relation to the intervention and control communities. The baseline data were compared to other sources of data when they were available.

### 3.3.1 Diarrhea

The prevalence of diarrhea in the previous 24 hours (point prevalence) was 6.4 percent (Table 3). The prevalence in the previous two weeks (period prevalence) was 13.0 percent. For children with diarrhea in the last two weeks (n=309), the average number of days was 5.4. The prevalence of diarrhea was higher in a previous study conducted in 1987 (DHS 1987). Several explanations account for this difference. First, the present study used a standard definition of diarrhea that required three or more loose stools per 24-hour period to be classified as having had diarrhea. Thus, if a child had two loose stools, a mother might consider this as diarrhea, but it was not coded as diarrhea in the baseline study. In the DHS study, the mother used her own definition of diarrhea. Second, the data from the DHS study include children from a larger catchment area than that of the present study. The 24-hour recall data from the DHS survey cover Central Guatemala as well as the North and South Occident. Third, this survey was conducted from February to April 1993; whereas, the DHS survey was conducted from September to December 1987. Diarrhea rates may vary by season. This implies that follow-up surveys should be conducted at the beginning of a calendar year, the same time as for the baseline survey. Fourth, over time one would expect that diarrhea rates would be reduced as developmental efforts progress. Fifth, the appearance of *Vibrio cholerae* in the region over the last two years, and the health education efforts this triggered, may have played an important role in reducing diarrhea. All these factors may explain why the diarrhea rates in the present survey were less than those six years previously.

The difference in diarrhea rates between surveys is less important than a possible difference in diarrhea between designated intervention and control communities. One would hope that the rates across these intervention groups would be similar. When the diarrheal indices were compared across the designated intervention and control groups, no significant differences were found (Table 4). That was true for point and period prevalence as well as for the average number of days a child experienced diarrhea. In fact, the point prevalence was slightly higher in the control communities compared to the intervention communities, while the reverse was true for period prevalence. A 25-percent reduction in diarrhea from 6.1 percent would be equivalent to 4.6 percent, and a 40-percent reduction would be equivalent to 3.7 percent. For period prevalence,

a 25-percent reduction from 11.5 percent is equivalent to 8.6 percent, and a 40-percent reduction would be 6.9 percent. Neither of the two groups approached these low levels of diarrhea.

**Table 3: Comparison of Diarrhea Rates from the Present Study to Previous Studies**

| Diarrhea Indicator | Present study February to April 1993 | DHS study September to December 1987 |
|---|---|---|
| 24-hour recall | 6.4% | 10.8% |
| 14-day recall | 13.0% | 17.0% |
| Average number of days | 5.4 | N/A |

**Table 4: Diarrhea Rates by Designated Control and Intervention Communities**

| Comparison Group | 24-Hour Recall | 14-Day Recall | Average Number of Days |
|---|---|---|---|
| Control (n = 1,973) | 6.1% | 11.5% | 5.6 (n = 226) |
| Intervention (n = 1,279) | 5.9% | 12.0% | 5.5 (n = 154) |
| P-value | 0.870 | 0.611 | 0.938 |

For average number of days with diarrhea, the control group had 0.1 more days of diarrhea than the designated intervention communities, but this difference was not significant. A 25-percent reduction in the number of days spent with diarrhea would be the equivalent of reducing the number of days from 5.6 to 4.2. A 40-percent reduction in the average number of days would be the equivalent of a reduction of 5.6 to 3.4 days. Thus, the diarrhea rates between the intervention and control communities can be considered similar. This will make it easier to compare intervention effects at the time of the follow-up survey.

### 3.3.2 Anthropometry

Nutritional anthropometry was measured and converted into standardized Z-scores, representing child's height-for-age, weight-for-age, and weight-for-height. Standardized Z-scores are the preferred form of presenting nutritional anthropometric data (Dibley 1987b). Children's measurements are compared to a reference population (i.e., U.S. children) and can be interpreted in the following manner. A Z-score of 0 indicates a normal child, same as the reference child. A negative number indicates that the child's height or weight is smaller than that of the reference

child, and a positive number means that the child is taller or heavier than the reference child. Z-scores below -2.00 indicate either moderate to severe stunting (height-for-age), wasting (weight-for-height), or underweight (weight-for-age) children. Children with Z-scores below -2.00 are more likely to die than children who have better nutritional status.

These three indicators identify different conditions. Height-for-age indicates long-term, or chronic, insults to nutritional status. For example, repeated bouts of diarrhea could result in shorter children as they age. Weight-for-height is used as an indicator of recent insults to nutritional status. A severe bout of diarrhea, for instance, may cause a child to lose weight, and this weight loss would be indicated by a low weight-for-height Z-score. Weight-for-age, is a less descriptive indicator of long-term or short-term nutritional status. By itself, weight-for-age cannot indicate whether a low value is due to short- or long-term nutritional problems, but is a composite indicator of short- and long-term insults to nutritional status. In the Guatemalan context, it indicates a large amount of stunting and no amount of wasting, which is consistent with earlier literature on the Guatemalan Highlands.

Among the children in the sample, the values for height-for-age (n=3,164), weight-for-age (n=3,231), and weight-for-height (n=3,164) reflect data from other studies. The average height-for-age Z-score was -2.632 $\pm$ 1.376. The weight-for-age Z-score was -1.761 $\pm$ 1.149, and the weight-for-height Z-score was -0.173 $\pm$ 1.041.

The nutritional data collected for the present study are comparable to the data collected during the demographic and health survey conducted in 1987 (Table 5). The areas surveyed in both studies include the Central region as well as the North and South Occident. While the communities may not be the same and one region may be over sampled relative to another, the data from both surveys indicate a similar situation.

**Table 5: Comparison of Stunting, Underweight, and Wasting from the Present Study to Previous Studies**

| Indicator | Present study | DHS study |
|---|---|---|
| Stunting | 71.5% | 69.4% |
| Underweight | 47.3% | 41.6% |
| Wasting | 2.4% | 1.7% |

The majority of the children are stunted. In fact, for every 10 children, seven were found to be below -2.00 Z-scores for height-for-age. On the other hand, these children are not wasted, or thin, and the low prevalence rate of wasting would be found in any normal population. Thus, children look appropriately proportioned for their height. Because stunting is so high and wasting is normal, weight-for-age falls in between these values. Weight-for-age is a composite of stunting

and wasting. In the absence of wasting, as is the case in Guatemala, weight-for-age reflects stunting.

The Z-scores and percent stunted were also compared by designated intervention and control communities (Table 6). Children from the designated intervention communities had Z-scores that were very similar to those of children from the control group. The number of stunted children was higher than in the intervention group, but the difference was not statistically significant. The difference was 3 percent, a small difference considering that more than 70 percent of children were considered stunted. Clearly, there is potential to reduce the number of stunted children.

**Table 6: Height-for-Age among 3,246 Children by Control and Intervention Communities**

| Comparison group | Z-scores | Stunting |
|---|---|---|
| Control (n = 1,927) | -2.63 ± 1.3 | 69.4% |
| Intervention (n = 1,239) | -2.62 ± 1.4 | 72.8% |
| P-value | 0.448 | 0.041 |

Weight-for-age, which is a composite of long-term (stunting) and recent (wasting) nutritional insults, is also a good indicator of environmental effects on health. The average weight-for-age Z-score for the entire sample was -1.76. Virtually no difference between comparison groups was found (Table 7). The proportion of underweight children was about 45 percent, and the difference between the intervention and control villages was 2.3 percent, which was not statistically significant.

**Table 7: Weight-for-Age among 3,227 Children by Control and Intervention Communities**

| Comparison group | Z-scores | Underweight |
|---|---|---|
| Control (n = 1,955) | -1.79 ± 1.16 | 45.0% |
| Intervention (n = 1,272) | -1.75 ± 1.14 | 47.1% |
| P-value | 0.317 | 0.246 |

Weight-for-height values were considered normal in this sample. With such low rates of wasting, no important differences would be expected between the two comparison groups. This was the case, as is shown in Table 8. It is unlikely that differences in wasting will be seen at the time of the follow-up evaluation.

**Table 8: Weight-for-Height among 3,160 Children by Intervention and Control Communities**

| Comparison group | Z-scores | Wasting |
|---|---|---|
| Control (n = 1,916) | -0.21 ± 1.03 | 2.2% |
| Intervention (n = 1,244) | -0.15 ± 1.05 | 2.7% |
| P-value | 0.176 | 0.409 |

### 3.3.3 Mortality

The mortality rates in the baseline sample are comparable across comparison groups. The infant mortality rate is about 78 per 1,000 live births, the 1-5 mortality rate is about 22, and the child mortality rate is about 91. No differences were found between the intervention and the control group (Table 9).

**Table 9: Mortality Rates by Designated Control and Intervention Communities**

| Comparison Group | Infant Mortality Rate (0-11 months) | 1-5 Mortality Rate (12-60 months) | Child Mortality Rate (0-60 months) |
|---|---|---|---|
| Control | 78.5 | 21.7 | 91.6 |
| Intervention | 74.1 | 22.1 | 87.4 |
| P-value | 0.870 | 0.611 | 0.938 |
| * See page 17 for calculations of rates. | | | |

### 3.3.4 Respiratory Disease

About one-third of the children were reported to have had a cough within two weeks of the interview (Table 10), and at any point in time about one-quarter of the children were reported to have a cough. Respiratory diseases account for more morbidity episodes that gastrointestinal infections This is in concordance with other studies that show respiratory diseases to be a more common cause of child illness in the Highlands; whereas gastrointestinal problems are more common in the hot lowlands. Differences were found between the two comparison groups, with a lower prevalence found in the intervention communities. No differences were found in the length of time that children spent with a coughing episode. Although differences in respiratory disease were found, it is unlikely that the PAYSA intervention will change these rates. Therefore, these differences are not problematic for the follow-up health effects.

**Table 10: Respiratory Disease Rates by Designated Control and Intervention Communities**

| Comparison Group | 24-Hour Recall | 14-Day Recall | Average Number of Days |
|---|---|---|---|
| Control (n = 1,973) | 24.7% | 37.1% | 6.5 (n = 728) |
| Intervention (n = 1,279) | 20.2% | 30.5% | 6.4 (n = 392) |
| P-value | 0.003 | 0.000 | 0.814 |

## 3.4 Knowledge, Attitudes, and Practices of Health-Related Practices

This section offers a general description of the KAP data, on a variable-by-variable basis. The structure of the description below follows from the twin objective of presenting general findings and second, of deriving specific recommendations as to what should be done by PAYSA when designing its educational component.

The knowledge and attitude data can be divided into two main groups: the knowledge and attitude questionnaire, and the observations of actual practices. Knowledge and attitude data are further subdivided into six areas of interest. Items in each of these areas are later summed to create a second index that delineates the group into those with more and those with less overall knowledge of a subject area. In the following section, we begin by discussing particular areas of interest individually, by intervention and control communities.

### 3.4.1 Prevention of Diarrhea

This section reports on the knowledge related to causes of diarrhea. Mothers were asked to identify as many causes as they could, but no prior information was given to prompt certain answers. The questions used for the survey are found in the anthropometric and morbidity sheet of the questionnaire (B01-B04,D).

When asked the most frequent cause of children's diarrhea, 28 percent of mothers could not provide a single cause. Of those who responded, some gave multiple responses because respondents were allowed to provide more than one response. The following responses (Table 11) were given in their order of frequency. Those that did not offer any response and those that offered no response for the domain under consideration were classified as "no" for that category.

The mothers' general understanding is correct in that lack of cleanliness is what causes diarrhea, but only one-third could identify any specific cause of diarrhea. Some finer categories could, however, be drawn within the range of responses. First, most mothers related diarrhea to general filthiness. For instance, it was felt that when children put dirty things in their mouths, this caused diarrhea. A second group of answers, cited less frequently, related diarrhea to ingestion of

contaminated food or water. A third category of answers identified mothers' neglect as a cause of diarrhea. For instance, mothers' dirty hands or the dirty dishes were perceived as a potential cause of diarrhea.

**Table 11: Responses Given to Question about How Children Get Diarrhea by Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n=1,971 | Intervention n=1,279 | Total n=3,250 |
| Lack of child cleanliness | 36.4% | 39.8% | 38.0% |
| Children putting dirty things in their mouths | 35.5% | 36.8% | 35.5% |
| Consume dirty water* | 23.4% | 29.8% | 25.6% |
| Consume dirty food* | 25.8% | 21.6% | 24.1% |
| General lack of cleanliness | 18.8% | 17.8% | 19.4% |
| Mother has dirty hands | 11.8% | 11.3% | 11.7% |
| Dishes are dirty | 10.5% | 11.0% | 10.9% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

Knowledge about the causes of diarrhea was similar in both comparison groups. For most causes, the differences between groups were fewer than 3 or 4 percentage points. Only for dirty water did the intervention group identify this more frequently than the control group, by 6.2 percentage points. This is not a big difference, particularly in light of the small number in either group who cited any reason.

Analysis of the data leads to several conclusions. Few mothers could identify correct responses for the causes of diarrhea. Knowledge was centered around general cleanliness rather than on specific practices that could lead to diarrhea. PAYSA should reinforce general messages while teaching and promoting specific practices that can prevent diarrhea.

A second, but related set of questions (B02-B03) asked mothers how children could avoid diarrhea in their home. Three-quarters of the mothers volunteered an answer. Of the remaining mothers, 2.7 percent said nothing could be done and 21.7 percent said they did not know. The distribution of answers by frequency and comparison groups appears in Table 12.

Half of the women knew that a clean house was an important deterrent of childhood diarrhea. However, less than 40 percent of the mothers could identify any one practice to prevent diarrhea. Proper hygiene, washing hands and food, was cited more frequently than covering drinking

water, using a latrine, or corralling animals. While proper hygiene should be stressed, the use of a latrine to prevent diarrhea should be vigorously promoted as well as the need to keep animals corralled and out of the home.

**Table 12: Responses Given to Question about How Children Can Avoid Getting Diarrhea**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n=1,152 | Intervention n=710 | Total n=1,862 |
| Keep house clean | 55.0% | 52.1% | 53.9% |
| Wash hands of child | 39.4% | 40.9% | 40.0% |
| Wash food* | 32.7% | 28.2% | 31.0% |
| Boil water | 29.6% | 27.8% | 28.9% |
| Cook food thoroughly | 27.4% | 25.2% | 26.6% |
| Wash dishes well | 22.7% | 22.8% | 22.7% |
| Wash mother's hands | 11.8% | 10.2% | 10.8% |
| Cover food | 10.2% | 9.7% | 10.0% |
| Cover drinking water | 7.5% | 6.8% | 7.2% |
| Use of a latrine | 7.7% | 5.8% | 7.0% |
| Keep animals corralled* | 2.6% | 0.9% | 1.9% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

Among those who volunteered a response, 50.7 percent provided three or more answers. An additional 18.3 percent offered two answers, while 30.9 percent gave only one or no answer. The goal of PAYSA was to have 80 percent understand the concept of contamination and 80 percent cite three or more causes of diarrhea. The data here show that we are far from that goal and that time and resources should be devoted to improve these rates.

In conclusion, most women do not know enough appropriate behaviors to prevent childhood diarrhea. The appropriate behaviors cited more frequently than others should be encouraged, and those cited less often should be vigorously promoted. It is important to demonstrate the practice itself and explain the rationale behind it. The two groups identified the same behaviors with a similar frequency. Thus, the groups are comparable on their knowledge of what causes diarrhea.

### 3.4.2 Treatment of Diarrhea

When asked about breastfeeding practices (questions B06-B07) during diarrhea episodes, 1.7 percent said they did not know what they would do if their child became ill with diarrhea. Of the remaining 98.3 percent, 88.5 percent were of the opinion they should continue breastfeeding, and 11.5 percent said they should stop (Table 13). When asked about feeding liquid or solid (i.e., non-breast) foods during diarrhea, 1.6 percent said they did not know what they would do, 91.4 percent said they should keep giving food to the child, whereas 8.6 percent said they should stop giving other liquids and solids. Although non-breast milk food would be offered in most episodes of diarrhea, it is not clear the food offered is appropriate in terms of quantity or quality. This issue, however, is beyond the scope of the project. Nevertheless, the data demonstrate that Guatemalan mothers instinctively adopt the correct behavior about feeding during diarrheal episodes. However, a few mothers would adopt an incorrect practice. Thus, positive reinforcement of feeding during diarrhea should be disseminated by PAYSA.

**Table 13: Responses Given to Question about How to Treat Childhood Diarrhea by Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n = 1,971 | Intervention n = 1,279 | Total n = 3,250 |
| Continue breastfeeding* | 88.3% | 91.2% | 88.5% |
| Continue with other foods | 92.0% | 91.2% | 91.4% |
| Know about ORS* | 84.6% | 74.8% | 80.7% |
| Know correct use of ORS* | 81.3% | 71.9% | 77.3% |
| Used ORS at least once* | 69.9% | 61.9% | 66.0% |
| Used ORS last episode | 53.1% | 50.3% | 51.3% |
| Know of home-made ORS* | 38.0% | 32.2% | 35.2% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

A number of questions (B08-B12) were asked of mothers about their knowledge and use of oral rehydration salts (ORS) therapy. The large majority of respondents said they knew about the ORS packets, and almost all of them identified its purpose correctly when an ORS packet was shown to them. In addition, two-thirds of the mothers said they had used the ORS packet before, and half said they used it the last time one of their children had diarrhea. Fewer mothers knew about home-made ORS, and of these very few knew how to prepare it correctly. Given the widespread availability of ORS envelopes and the good knowledge mothers have of their use, it should not be a priority to teach mothers how to make home-made ORS, because an incorrect preparation may do more harm than good. Instead, efforts should concentrate on reinforcing the use of ORS

envelopes and ensuring their continuous availability through volunteers. We did not ask mothers about specific details relating to ORS use. For instance, they may not know about quantities to be administered, average durability of the product once prepared, and so forth. The PAYSA education team should make sure that the proper handling of ORS is part of the message.

### 3.4.3 Breastfeeding Patterns

Breastfeeding is almost universal in rural Guatemala (Pineda et al. 1992). In this study, mothers were asked, (1) if they breastfed without giving any complementary food, either liquid or solid, (2) if some sugar water, corn beverage, or other liquid were given in addition to breastfeeding, (3) if they gave some liquid or solid food in addition to breastfeeding, and (4) if they gave only liquid or solid food and no breastfeeding. In the analysis, the categories are reported as (1) full breastfeeding, which includes exclusive (no water) and predominant breastfeeding (some water or juice in addition to breastfeeding)—the data were not collected to clearly and unambiguously differentiate between these two possibilities; (2) partial breastfeeding, which collapses categories 2 and 3 into breastfeeding plus milk, corn beverage, formula, or other solids and liquids; and (3) no breastfeeding (category 4 above).

In our sample, 96 percent of all children younger than 6 months received some breastmilk and 79 percent reported full breastfeeding (see Table 14). Some full breastfeeding is also reported for older age groups. For instance, 23 percent and 3 percent of mothers of children between 6-12 and 12-24 months of age, respectively, still report full breastfeeding at these ages. If these figures describe the population, these latter statistics are worrisome. Breastmilk is known to contain all the necessary nutrients to ensure adequate growth of the infant up to 4-6 months of age, but complementary foods are essential after this age (WHO/UNICEF 1990). It would be worth investigating in these communities if there really is a group of mothers who truly breastfeed exclusively throughout the first year of the child's life. If so, this issue should be part of the educational messages taught by PAYSA.

The protective effect of breastfeeding against diarrheal diseases is well documented (deZoysa et al. 1991). Breastmilk provides direct immunity to the infant and also prevents the use of contaminated liquids in infant feeding. Among young infants, the association between feeding mode and diarrhea shows a dose-response relationship. That is, exclusive breastfeeding is associated with the smallest risk of diarrhea; whereas breastfeeding complemented with other liquids and foods is associated with a higher risk of diarrhea; and a still higher risk of diarrhea is seen among bottlefed children (Brown et al. 1989; Popkin et al. 1990; Victora et al. 1989). Because of the very high prevalences of breastfeeding among infants less than six months in our sample, comparisons can only be made between fully and partially breastfed children.

Tables 15 and 16 show that among the 0-6 months age group, partially breastfed infants have more diarrhea than fully breastfed infants. For diarrhea in the previous 24 hours, the risk of having diarrhea is 2.26 (95-percent confidence interval: 0.77 to 6.43) times higher among partially breastfed children compared to fully breastfed children. For diarrhea in the previous two weeks, the increase in risk is 2.18 (0.99 to 4.75) times higher. At the 6-12 month and 12-24

month age groups, an interesting comparison to make would be between the group of non-breastfed infants, and those breastfed to some extent. Because of the small sample of non-breastfed infants in our sample, this comparison could not be made.

**Table 14: Breastfeeding Pattern by Age Group: Numbers of Children (Values in Parenthesis Represent Column Percentages)**

| | Age Group | | | |
|---|---|---|---|---|
| **Feeding Pattern** | **0-6 Months** | **6-12 Months** | **12-24 Months** | **24-60 Months** |
| Full breastfeeding | 302<br>(79) | 74<br>(23) | 17<br>(3) | 2<br>(12) |
| Partial breastfeeding | 68<br>(18) | 248<br>(76) | 408<br>(63) | 193<br>(10) |
| No breastfeeding | 14<br>(4) | 3<br>(1) | 223<br>(34) | 1,690<br>(90) |
| Column total (row percentage) | 384<br>(12) | 325<br>(10) | 648<br>(20) | 1,885<br>(58) |
| (Note: no significant differences were found between intervention and control groups in terms of feeding patterns.) | | | | |

**Table 15: Percent and Number of Children Who Had Diarrhea in Last 24 Hours per Age Group**

| | Breastfeeding Pattern | | | |
|---|---|---|---|---|
| **Age** | **Full BF** | **Partial BF** | **No BF** | **Total** |
| 0-6 months | 12/302<br>(4%) | 7/82<br>(9%) | N/A<br>N/A | 19/384<br>(5%) |

**Table 16: Percent and Number of Children Who Had Diarrhea in Last 14 Days per Age Group**

| | Feeding Pattern | | | |
|---|---|---|---|---|
| **Age** | **Full BF** | **Partial BF** | **No BF** | **Total** |
| 0-6 months | 24<br>(8%) | 13/82<br>(16%) | N/A<br>N/A | 37/384<br>(10%) |

In conclusion, then, breastfeeding practices seem to follow the usual recommendations, but some concern exists over delayed introduction of complementary foods beyond 6 months of age. Further research is also needed to determine the extent to which the WHO/UNICEF recommendation of exclusive breastfeeding for the first 4-6 months is being followed. Although not specifically a part of the PAYSA's educational target, exclusive breastfeeding should be encouraged among mothers of children under 6 months since it is known to have an important effect on reducing diarrhea. Though this is a complicated issue that involves more than making statements, a word of caution should be introduced to these mothers about the necessity of introducing complementary foods around 6 months of age.

### 3.4.4 Garbage Disposal and Environmental Awareness

Various questions (B18-B19) were asked about garbage disposal (Table 17). Three percent of the respondents said they did not know what happened to the garbage (e.g., their husbands took it away). Of the remaining 97 percent, less than half said it could be burned, buried, or made into compost. Thus, half of the time, garbage is not disposed of properly. When asked about other possible forms of disposal, 40 percent said it could be buried, 34 percent said it could be burned, and 32 percent said it could be used to make compost. In addition, 13 percent said they ignored what else could be done, and 4 percent affirmed that nothing else could be done.

The data pertaining to garbage disposal indicate a major problem in the Guatemalan Highlands. It is less likely that people do not want to dispose properly of their garbage, but more likely that they do not know how to do it correctly. The PAYSA team should dedicate resources and time to educate people about proper garbage disposal. We feel that efforts should concentrate on the teaching and benefits of composting so that people can derive some economic benefit from an adequate disposal of organic residue. Other experiences show that this is a popular approach to garbage disposal when properly taught and supported (CARE 1992).

A few questions (B20-B21) were asked about the respondent's attitude about environmental issues (Table 17), particularly what could be done to protect forests, water sources, the land and earth, and the air. Half of the respondents knew that forests should be protected, by not cutting down trees and by planting more trees. Other possible responses, such as where to defecate and how to avoid fires, were cited by fewer than 10 percent of mothers. One reason for the low levels of environmental awareness was that the term environment, as a concept, is not well understood among the Highland population. A second issue is that efforts to promote environmental awareness are usually directed to men. All of the respondents in the baseline survey are women.

When asked about the effects of deforestation (B21), 15 percent said they could not answer the question (Table 17). However, the majority knew it reduced water availability and rainfall (Table 17). Only one-third suggested it reduced supplies of firewood and building materials, but few knew that climatic changes could occur, soil would erode, or the wildlife population would decrease.

As a general point, it is clear that appropriate environmental knowledge is lacking. This deficit in knowledge is more overwhelming than any differences found between the intervention and

**Table 17: Responses Given to Questions about Garbage and Environmental Awareness by Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n=1,971 | Intervention n=1,279 | Total n=3,250 |
| | **Forms of garbage disposal** | | |
| Burn garbage* | 20.5% | 12.9% | 17.5% |
| Bury garbage | 14.6% | 12.5% | 13.8% |
| Make compost* | 13.6% | 9.1% | 11.8% |
| Other forms of disposal* | 1.1% | 0.7% | 1.0% |
| Do not know how to dispose of garbage | 3.6% | 1.5% | 2.8% |
| | **Environmental awareness** | | |
| Do not cut trees | 56.1% | 58.4% | 57.0% |
| Plant trees | 52.8% | 53.4% | 53.0% |
| Remove garbage | 8.2% | 7.3% | 7.9% |
| Use water in moderation | 7.1% | 6.0% | 6.7% |
| Don't defecate/urinate in rivers/lakes | 5.2% | 5.8% | 5.4% |
| Avoid fires* | 5.9% | 3.2% | 4.9% |
| Dispose of toxic wastes* | 3.4% | 2.0% | 2.8% |
| Respect plants/animals* | 2.9% | 1.6% | 2.4% |
| Avoid making smoke | 2.2% | 1.3% | 1.9% |
| | **Effects of deforestation** | | |
| Less water | 56.9% | 60.1% | 58.1% |
| Less rain | 54.9% | 53.3% | 54.3% |
| Less firewood | 36.0% | 38.7% | 37.1% |
| Changes in climate* | 16.7% | 12.4% | 15.0% |
| Soil erosion* | 8.7% | 5.2% | 7.3% |
| Less wildlife | 5.2% | 3.9% | 4.7% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

control communities. In the context of limited resources, however, we feel that this issue should receive less attention than other, more pressing issues about personal and domestic hygiene. To some extent this is more of a community problem than a household problem in terms of gaining direct benefit to health of children in the short term. In addition, even if people knew about the benefits of planting trees, little would be done unless tress were provided by the project for planting. Although, this is an important issue, it is beyond the scope of PAYSA and should not be a priority.

### 3.4.5 Health Agents (Promoters)

A series of questions assessed the level of intervention of health agents in the community and in the family (B22-B26). The role of two distinct agents was included in the questions: the health promoter (a DGSS-supervised person); and the health technician (coming from the Jefatura de Area de Salud). Given the remoteness of the communities visited, few of the respondents knew about the health technician. Therefore, the data reported below (Table 18) allude only to the role of the health promoter. In 40 percent of the cases, mothers knew of the promoter and could mention his or her name correctly. Few (< 10 percent), however, attended a meeting offered by a promoter or reported having received home visits from the promoter, nor were they left with any recommendation when visited.

**Table 18: Responses Given to Question about Health Agents in Control and Intervention Communities**

| | Type of Community | | |
|---|---|---|---|
| Response | Control n = 1,971 | Intervention n = 1,279 | Total n = 3,250 |
| Know an agent* | 39.6% | 46.6% | 40.3% |
| Know agent's name* | 38.0% | 43.7% | 38.2% |
| Attended a meeting with a health agent* | 6.9% | 10.5% | 8.2% |
| Was visited by a health agent in last four weeks* | 9.5% | 6.2% | 7.8% |
| Health agent left them with a task to do | 6.3% | 4.9% | 5.4% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

Sufficient resources should be directed to promoters and volunteers so that they have the capacity to deliver basic health messages to the intervention communities. The role of the PAYSA volunteers is important to attain project objectives. Effort should be made to establish a rapport

between health agents and the communities and to monitor and orient their work. Their presence does not mean that messages will be readily received and practiced. Furthermore, other studies (Bergeron 1992) have shown that the transfer of knowledge into actual practices is weak in the absence of the intervention of health agents, who must continuously reinforce the newly acquired knowledge until it is properly and definitely integrated. Additional studies (Guptill et al. 1993; Esrey 1993a) indicate that face-to-face contact by health agents is required to get people to practice what they learn.

### 3.4.6 Demonstration of Hand Washing

Hand washing will be an important part of the PAYSA package of messages. Therefore, knowledge and practice of hand washing was asked of mothers (B04), and they were also asked to demonstrate how they washed their hands (B05). When mothers were asked when they should wash their hands(B04), 99 percent of respondents provided at least one answer. The order of responses is provided in Table 19. A high percentage of mothers knew that washing hands before cooking and eating was important. Few were able to offer that washing hands after defecation or handling children's stools was important. Only 25 percent were able to provide three or more correct answers for when to wash hands. Two responses were cited by 58 percent, and about 17 percent provided only one response. The number of correct responses was slightly higher in the control group compared to that of the intervention group for hand washing associated with feces, but the responses were low in both groups.

While most mothers used running water when they demonstrated hand washing, only half used either soap or ashes, and only a few dried their hands after washing. About 7 percent refused to demonstrate how to wash hands, perhaps because of a lack of water. An additional 9 percent did not use an appropriate technique to wash their hands. For instance, mothers may have dipped their hands into a bucket of water, contaminating the water, rather than using dripping or running water so the waste water is not put back into a water vessel. About 40 percent of mothers used only one good practice (e.g., dripping water, soap or ashes, or drying hands), an additional 40 percent used two good practices, and only 11 percent demonstrated all three good practices.

Although it appears that the importance of hand washing is understood, the importance of hand washing relative to fecal material is not well understood. Thus, PAYSA should focus on hand washing after defecation or the handling of children's stools or other fecal material. Attention should also be given to the correct practices of washing hands. The use of dripping water should be reinforced, as well as the use of soap, and the need to dry hands with a clean cloth. Demonstrations of these practices should accompany any messages.

Mothers also demonstrated how to wash dishes. The majority (92 percent) agreed to do the demonstration, and of those who did, nearly 89 percent used water, but only half used soap or ashes. Only one-quarter of the sample could demonstrate three good practices, and only 8 percent demonstrated all four good practices.

**Table 19: Responses Given to Questions about Hand and Dish Washing by Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n = 1,971 | Intervention n = 1,279 | Total n = 3,250 |
| | When should hands be washed | | |
| Before eating | 89.9% | 88.3% | 89.2% |
| Before cooking | 79.3% | 78.2% | 79.0% |
| After defecation* | 29.4% | 22.6% | 27.1% |
| After changing diapers | 9.5% | 7.6% | 8.0% |
| Before breastfeeding* | 6.7% | 3.2% | 5.2% |
| | Demonstration of hand washing | | |
| Used dripping water | 85.6% | 86.7% | 86.3% |
| Used soap or ashes* | 55.4% | 44.6% | 52.3% |
| Dried hands with cloth* | 17.5% | 14.5% | 16.3% |
| | Demonstration of dish washing | | |
| Used clean water* | 87.4% | 90.9% | 88.5% |
| Used soap or ashes* | 62.0% | 50.0% | 57.5% |
| Dried dishes with cloth | 14.0% | 11.7% | 13.6% |
| Dishes were kept stored* | 23.4% | 20.1% | 23.0% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

## 3.5 Observations of Health-Related Practices

Knowledge that is self-reported could provide some misleading information. Obvious knowledge, that is routinely practiced, may not always be cited. Thus, observations (Section C of the questionnaire) were measured in the baseline survey to complement the data on knowledge reported by the mothers. Observations, though, may reflect a cleaner than normal environment because of the presence of guests (e.g., interviewers). Thus, the results from the knowledge and observation sections of the questionnaire that overlap should be examined together. Three general areas of observation data were collected. They are general household cleanliness (C1-C11), the condition of the latrine (C12-C22), and the type of water supply (C23-C26).

### 3.5.1 General Household Cleanliness

According to PAYSA's education component manual, the messages that appear below (Table 20) are to be taught by the volunteers to the families in the project. For each of the messages shown below, the percent with a correct practice is indicated. In general, homes were free of obvious fecal material, and mothers' hands were clean. However, many homes were found to be unclean.

**Table 20: Percent of Correct Practices as Observed by Enumerators by Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n = 1,152 | Intervention n = 710 | Total n = 1,862 |
| Inside home free of feces | 80.3% | 81.3% | 80.7% |
| Mother with clean hands | 74.4% | 72.0% | 73.5% |
| No dirty diapers around* | 67.5% | 62.4% | 65.6% |
| Drinking water covered | 62.0% | 62.1% | 62.1% |
| No feces in front patio | 62.6% | 61.3% | 62.0% |
| Food was covered | 59.6% | 56.3% | 58.4% |
| No garbage on floors | 52.6% | 51.6% | 52.3% |
| Dishes were clean/stored | 48.4% | 44.9% | 47.0% |
| Yard free of garbage | 45.0% | 44.2% | 44.6% |
| No animals in home | 32.3% | 33.9% | 33.3% |
| Animals tied up | 31.0% | 28.7% | 30.1% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

Although some homes were cleaner than others, most families failed to meet all PAYSA goals for surveyed items. Because the presence of visitors to the villages may have resulted in a cleaner than normal household on the day of observation, these results are indicative of a generally unclean environment. Thus, all messages deserve much attention during the educational campaign. A strategy should be devised by PAYSA that uses insights from the numbers shown in Tables 20 and 23 to prioritize messages related to the importance of reducing the instances of diarrhea.

Some differences between the knowledge and the observation data were found. For instance, three-quarters of mothers had clean hands upon observation, but only 10 percent cited clean hands as a way to prevent diarrhea. When discrepancies like this occur, the hygiene practices should be reinforced, building on a positive observation rather than just promotion as might be done given the poor score from knowledge data. Some data showed a concordance between reported

knowledge and observed practices. For example, PAYSA would like to achieve a goal of having 80 percent of animals corralled. In this sample, only 30 percent of animals were tied up, according to mothers' reports and observations. Concordance figures, such as this, suggest that information on the importance of corralling animals should be introduced along with knowledge of how to do it properly.

### 3.5.2 Condition of the Latrines

Observations about latrines were included in the questionnaires, particularly for use in the follow-up surveys. Surprisingly, many houses already had a latrine in their backyard (63.2 percent), and 56.1 percent of the families reported using a latrine for defecation. Evidence of daily use was observed among those with a latrine. The conditions of these latrines, however, varied greatly. The majority of the latrines had walls and a roof, but few had a properly functioning door. Of those with a door, 80 percent were closed (Table 21). The bowl cover was closed in half of the latrines, and its surroundings were adequately clean in two-thirds of the cases. Latrine characteristics were similar in the comparison groups. Thus, there is evidence that people who have latrines used them properly, although they seem not to be aware of the importance of maintaining a properly functioning door. The knowledge data also suggest that the importance of a latrine as a preventive measure is not well understood.

**Table 21: Characteristics of Latrines Found in Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n=742 | Intervention n=437 | Total n=1,179 |
| Evidence of use | 88.5% | 90.4% | 89.2% |
| Presence of odor | 79.4% | 81.9% | 80.3% |
| Presence of walls* | 77.8% | 72.3% | 75.7% |
| Presence of roof | 71.0% | 66.9% | 69.5% |
| Appeared clean | 66.7% | 67.9% | 67.1% |
| Lid was on latrine | 55.0% | 54.7% | 54.7% |
| Presence of door | 26.3% | 24.7% | 24.7% |
| Of those with doors the percent closed | 83.0% | 82.1% | 79.1% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

It was surprising to find such a high rate of latrine ownership, especially considering that these were built by the household, not by a project. These results suggest an awareness of the

importance of fecal disposal, whether or not it is for disease prevention. It is not clear, however, that new latrines of better construction will result in higher usage rates and proper maintenance. This situation should be monitored closely by PAYSA because of the consistent reports from around the world on the health benefits from proper sanitation.

### 3.5.3 Type of Water Supply

Drinking water came from a variety of sources in these communities. The most frequently cited source of water came from a superficial well located somewhere in the village. About one-third of homes (Table 22) relied on this source. About 45 percent of the sample indicated they relied on a vinyl tube, community supply, or a tap in the home. Finding plastic tubes and domestic taps is somewhat incongruous, as it suggests the presence of water in the house, which is what PAYSA is supposed to provide. With self-installed plastic tubes, however, there was almost never a year-round supply to the home; the tubes were frequently broken and the water that came out was neither treated nor filtered. Thus, any advantages were partial and temporary at best, and mothers had to go out most of the time to fill their water needs. Domestic taps are generally the remnants of past development projects. That these communities have requested PAYSA's support indicates that these systems are insufficient for the daily needs of the villages. In 20 percent of the taps in the home, no water came out of the taps, either because the source had become dry over the years or because the pipes were broken between the distributing tank and the village. We must conclude that none of the villages in our sample had an adequate or a sufficient year-round water supply, although it must be recognized that a variety of situations was found, some of which were better than others.

**Table 22: Characteristics of Water Supplies Used by Families in the Intervention and Control Communities**

| Response | Type of Community | | |
|---|---|---|---|
| | Control n = 1,152 | Intervention n = 710 | Total n = 1,862 |
| Superficial well* | 29.3% | 38.0% | 32.6% |
| Vinyl tubing to the home* | 22.7% | 17.2% | 20.5% |
| Community tap* | 18.4% | 8.7% | 14.7% |
| Home tap | 11.7% | 12.1% | 11.9% |
| Spring | 9.0% | 11.7% | 10.0% |
| House well* | 7.7% | 4.9% | 6.7% |
| River/lake* | 0.9% | 7.2% | 3.3% |
| * P-value for the difference between control and intervention group is less than 0.05. | | | |

Differences in sources of water existed between the intervention and control communities. If an advantage existed in either group, it was probably in the control communities. For instance, more

control families used a vinyl tubing or the community tap, while more intervention communities relied on superficial wells and river or lake water. Most residents probably relied on contaminated and insufficient water.

In summary, the two community groups are comparable in their overall living conditions and knowledge of health-related practices. No trend was found across the comparison groups, and any differences were very small and were random rather than systematic. Thus, no tendency for a specific bias exists in the sample. Furthermore, living conditions reflect poverty, and knowledge about appropriate health behaviors is scant. This helps explain the poor health status of the population as well as the lack of differences in health parameters between the two comparison groups. Any health differences found between intervention and control communities were minor and not of biological importance. The efforts made to identify comparable intervention and control communities where, therefore, successful.

## 3.6 Prioritization of Health Messages

A fundamental question from PAYSA's point of view is how to structure the health education component. Should all health education messages be promoted at once, or is it more efficient to concentrate only on one or a few at a time, ensuring their proper integration by recipients before moving on to other messages? Anecdotal evidence suggests that the second approach has merits, since the successful promotion of any single practice proves to be a formidable task in itself. For instance, a project conducted by INCAP in Santa Maria de Jesus near Antigua, Guatemala, taught proper hand washing techniques to mothers. It took a full year of constant reinforcement before the project officers considered the results satisfactory (Hurtado, personal communication).

Assuming PAYSA chooses this second approach, then we believe messages whose effects on health would be greatest should be selected and prioritized. Tests were run to establish this priority list. Table 23 presents results from this method of prioritization (most important messages or groups of messages first).

As will be noted in Table 23, not all conditions are examined. Only one condition per health area is presented (stunting for anthropometry; total child deaths for mortality; and 14-day recall for morbidity). We selected these conditions because not all health indicators are equally responsive (we selected those most responsive to changes in risk factors in terms of the statistics examined); and because reporting on all health indicators would not improve the type of result, but would confuse the presentation of findings in a lengthy table.

All the tests used in this section are based on observational data, which is more reliable and easier to articulate with specific health messages. For each of the 12 observations, the odds ratio (OR) and chi-square ($\chi^2$) statistics were computed from cross-tabulation with selected health indicators. The first step in ranking observations ("risk factors") involves looking at the condition that affects the largest proportion of the population, so that the elimination of the risk factor would reach the largest number of children. The very high level of stunting found in this study (more than 70 percent of all children under -2.0 Z-score) make this condition the indicator of choice for that purpose. In addition, this indicator showed the highest responsiveness to all

changes in risk factors. The second criterion was the odds ratio, provided the chi-square was significant. The third one was the homogeneity of the selection resulting from the above with other risk factors, in terms of the general domain of household hygiene they respectively covered (e.g., protection from food contamination, and outdoor cleanliness).

**Table 23: Cross-Tabulation of Health Indicator by Observed Practice**

| | Diarrhea Recall, 14 days | Stunted | Families with Child death |
|---|---|---|---|
| Percent of population affected by condition | 11.7 | 70.2 | 9 |
| **Promote Adequate Use of Water** | | | |
| Clean dishes | OR 1.17<br>$\chi^2$ .25 | 1.50<br>.000 | 1.41<br>.04 |
| Mother's hands clean | OR 1.19<br>$\chi^2$ .09 | 1.34<br>.003 | 1.56<br>.01 |
| **Promote Cleanliness Outdoors** | | | |
| Patio floors without feces | OR 1.62<br>$\chi^2$ .000 | 1.40<br>.000 | 1.69<br>.013 |
| No mud holes | OR 1.33<br>$\chi^2$ .03 | 1.11<br>.026 | 1.81<br>.08 |
| Patio floor without garbage | OR 1.07<br>$\chi^2$ .516 | 1.26<br>.003 | .93<br>.422 |
| No dirty diapers in sight | OR .71<br>$\chi^2$ .003 | 1.08<br>.338 | 1.24<br>.29 |
| **Promote Animal Control** | | | |
| Animals tied up | OR 1.00<br>$\chi^2$ .985 | 1.38<br>.003 | .91<br>.32 |
| Animals out of home | OR .75<br>$\chi^2$ .011 | 1.33<br>.000 | 1.18<br>.257 |
| **Promote Protection from Food Contamination** | | | |
| Food covered | OR 1.53<br>$\chi^2$ .000 | 1.20<br>.03 | 1.09<br>.913 |
| Water covered | OR 1.12<br>$\chi^2$ .42 | 1.13<br>.13 | 1.08<br>.93 |
| **Promote Cleanliness Indoors** | | | |
| House floors without garbage | OR 1.22<br>$\chi^2$ .10 | 1.17<br>.07 | 1.24<br>.48 |
| House floor without feces | OR .85<br>$\chi^2$ .34 | 1.16<br>.16 | 1.01<br>.98 |

According to Table 23, the domains for interventions that should be prioritized are, in order of importance:

1. *Promote adequate use of water.* The most effective targeting should initially concentrate on educating mothers about proper use of water and how to use water for cleaning purposes (dishes and self-hygiene). The data suggest eliminating this risk factor could reduce stunting up to 50 percent, and mortality up to 56 percent (if this is not confounded by other influences such as socioeconomic factors).

2. *Promote cleanliness outdoors.* The elimination of this group of risk factors, if taken as a whole, could mean substantial benefits for children's health. Particularly, mothers should be alerted to the problems associated with dirty patio floors, which are a young child's play area. The importance of keeping these spaces free of garbages, feces, and mud holes cannot be overemphasized.

3. *Promote animal control.* Animals left free to roam in the community may carry germs that will be introduced in the homestead later if they are allowed to enter the house or patio area. Because the effects of this practice are reduced here, educationally this is not a high priority. Although animal control may improve nutritional status, it is not related to a reduction in diarrhea or death.

4. *Promote protection from food contamination.* Maintaining food properly covered seems to have a large effect on morbidity, but the number of people who will benefit from concentrating resources on this aspect is reduced. The same can be said about water; therefore, it is suggested not to dedicate all the attention to this issue; rather it should be mentioned regularly, and specific information about covering food and water could be provided once more priority areas have been covered.

5. *Promote cleanliness indoors.* None of the risk factors included here showed up to be significantly associated with any of the health indicators. This is therefore the group of messages of least priority.

## 3.7 KAP Indices

The similarities between intervention and control communities mask the differences in SES and KAP among the mothers in both groups. A comparison of these differences should shed light on the direction of the expected changes in health outcomes following the intervention. Therefore, this section compares SES and KAP differences and their association with health outcomes. To do this comparison it was necessary to identify those with better knowledge and practices and compare the health of their children to those with worse knowledge and practices, regardless of whether they came from an intervention or a control community.

Several methods could be chosen to create the indices from the KAP and observation data. To make this comparison, we chose a simple solution. For example, several responses were possible for ways to prevent diarrhea (Table 5). All of these responses, coded as "yes" (1) or "no" (0), were summed for each respondent. Then, those with a combined total less than the median score

of the sample were classified as lower median, while those with a score above the median were classified as upper median.

Then, health differences were compared for these two groups, and all three major health outcomes were examined. A drawback of this method is that some children in the lower median will have identical characteristics to some children in the upper median group. This will tend to attenuate differences, making it less likely to find statistically significant results. On the other hand, those with better knowledge may also be those with better SES conditions. This would tend to make it easier to find differences between the lower and upper median groups. For the purposes of this report, we did not attempt to correct either of these potential problems.

In this section, six main indices will be used: (1) a socioeconomic index that includes assets of household wealth; (2) a general knowledge of how diarrhea can be prevented; (3) a knowledge of how diarrhea could be treated; (4) observations of general household cleanliness; (5) knowledge of sound environmental practices; and (6) an index reflecting the quality of latrine construction (if any). The composition of these indices, along with the various sub-indices used in creating the six indices, are described in more detail in Appendix 5.

### 3.7.1 Health and Socioeconomic Status

Children who came from families with better living conditions had less diarrhea, better nutritional status, and lower mortality (Table 24).

Most of these differences were statistically significant. These differences indicate that SES is an important covariate. Thus, when the effects from the PAYSA intervention are compared, differences in SES among children should be controlled in the analyses.

### 3.7.2 Health and Knowledge of Prevention of Diarrhea

Two sets of questions were used to create the index on prevention of diarrhea. First, separate indices were created from the responses to questions B01 on the one hand and for B02 on the other. The sum of these two indices was used to create a new index. This new index was divided into two groups, lower and upper median. (See Appendix 5.) The results from this index are shown in Table 25.

Those with more knowledge of how to prevent diarrhea had children with shorter episodes of diarrhea, lower infant mortality, and taller and heavier children. No differences were found in the prevalence of diarrhea. This might reflect the fact that better knowledge of how to prevent diarrhea does not necessarily block or eliminate the transmission of pathogens to children, but rather reduces the number of pathogens ingested. This would result in less severe diarrhea (i.e., number of days). This type of health benefit would also be reflected in less mortality and better growth of children.

These results suggest that an improvement in knowledge, presumably leading to preventive practices, would result in health benefits. Such results might be a 13-percent reduction in time

**Table 24: Health Outcomes by Differences in Socioeconomic Status**

| | COMPARISON GROUP | | |
|---|---|---|---|
| HEALTH OUTCOME | Lower Median (N = 1,300) | Upper Median (N = 1,933) | P-VALUE |
| Diarrhea | | | |
| 2-week recall | 13.0% | 10.8% | 0.065 |
| 24-hour recall | 7.0% | 5.4% | 0.063 |
| Duration | 5.9 days | 5.3 days | 0.085 |
| Mortality rate/1,000 live births* | | | |
| Infant (0-11 months) | 95.3 | 73.5 | 0.035 |
| 1-5 (12-60 months) | 20.7 | 12.4 | 0.067 |
| Child (0-60 months) | 116.0 | 85.9 | 0.008 |
| Anthropometry (<-2 SD) | | | |
| Weight-for-age | 48.2% | 42.5% | 0.001 |
| Height-for-age | 72.0% | 68.7% | 0.049 |
| Weight-for-height | 2.8% | 1.9% | 0.062 |

* Number of deaths that occurred among the mothers divided by the number of live children in each comparison group.

**Table 25: Health Outcomes by Differences in Knowledge of Prevention of Diarrhea**

| | COMPARISON GROUP | | |
|---|---|---|---|
| HEALTH OUTCOME | Lower Median (N = 1,603) | Upper Median (N = 1,648) | P-VALUE |
| Diarrhea | | | |
| 2-week recall | 11.6% | 11.7% | 0.957 |
| 24-hour recall | 6.4% | 5.7% | 0.435 |
| Duration | 6.0 days | 5.2 days | 0.054 |
| Mortality rate/1000 live births* | | | |
| Infant (0-11 months) | 92.2 | 72.6 | 0.055 |
| 1-5 (12-60 months) | 17.6 | 14.0 | 0.429 |
| Child (0-60 months) | 109.7 | 86.6 | 0.039 |
| Anthropometry (<-2 SD) | | | |
| Weight-for-age | 47.9% | 41.8% | 0.005 |
| Height-for-age | 72.2% | 67.9% | 0.008 |
| Weight-for-height | 2.3% | 2.2% | 0.861 |

* Number of deaths that occurred among the mothers divided by the number of live children in each comparison group.

spent with diarrhea, a 21-percent reduction in infant mortality, a 6-percent reduction in stunting, and a 13-percent reduction in underweight children.

### 3.7.3 Health and Knowledge of Treatment of Diarrhea

The index created for this comparison is based on the possible responses from questions B6-B16. These are also shown in Table 13. The results from Table 26 indicate that increased knowledge of how to treat diarrhea will result in taller and heavier children and less infant mortality. This is consistent with what is known about use of ORS. It does not reduce the burden of diarrhea (e.g., prevalence of episodes or duration), but it can reduce tne consequences when diarrhea occurs (e.g., poor growth of children and increased mortality). On the basis of the figures below, mortality could be reduced by 32 percent, underweight children by 8 percent, and stunted children by 4 percent. This assumes that children in the intervention communities, presently without appropriate treatment for diarrhea, will receive better treatment practices from their mothers following the intervention by PAYSA.

**Table 26: Health Outcomes by Differences in Knowledge of Treatment of Diarrhea**

| | COMPARISON GROUP | | |
|---|---|---|---|
| HEALTH OUTCOME | Lower Median N = 1,438 | Upper Median (N = 1,817) | P-VALUE |
| Diarrhea | | | |
| 2-week recall | 11.5% | 11.8% | 0.837 |
| 24-hour recall | 5.8% | 6.2% | 0.595 |
| Duration | 5.7 days | 5.5 days | 0.608 |
| Mortality rate/1000 live births* | | | |
| Infant (0-11 months) | 99.9 | 68.1 | 0.002 |
| 1-5 (12-60 months) | 20.2 | 12.2 | 0.073 |
| Child (0-60 months) | 120.2 | 80.4 | 0.000 |
| Anthropometry (<-2 SD) | | | |
| Weight-for-age | 46.9% | 43.1% | 0.028 |
| Height-for-age | 71.6% | 68.8% | 0.083 |
| Weight-for-height | 1.9% | 2.5% | 0.209 |

* Number of deaths that occurred among the mothers divided by the number of live children in each comparison group.

### 3.7.4 Health and Observations of Household Cleanliness

The questions used for this index were C1-C11 and are shown in Table 27. Those with cleaner households, as measured by observations, did not have fewer cases of diarrhea than those with households ~~not~~ considered to be less clean (Table 27). The prevalence of diarrhea was greater in the upper median, and the duration was higher in the lower median. None of these differences were statistically significant. The mortality of children 1-5 years of age was less in the upper median than in the lower median. This was equivalent to a 41-percent reduction in childhood mortality. Both weight-for-age and height-for-age were significantly lower in the upper median group than in the lower median group. There was a 16-percent reduction in underweight children and a 10-percent reduction in stunted children.

**Table 27: Health Outcomes by Differences in Health Practices (Observational Data)**

| | COMPARISON GROUP | | |
|---|---|---|---|
| HEALTH OUTCOME | Lower Median (N = 1,352) | Upper Median (N = 1,899) | P-VALUE |
| Diarrhea | | | |
| 2-week recall | 10.9% | 12.3% | 0.220 |
| 24-hour recall | 5.6% | 6.3% | 0.409 |
| Duration | 5.8 days | 5.4 days | 0.269 |
| Mortality rate/1000 live births* | | | |
| Infant (0-11 months) | 84.3 | 80.7 | 0.728 |
| 1-5 (12-60 months) | 20.7 | 12.2 | 0.060 |
| Child (0-60 months) | 105.0 | 92.9 | 0.287 |
| Anthropometry (<-2 SD) | | | |
| Weight-for-age | 49.3% | 41.6% | 0.000 |
| Height-for-age | 74.1% | 67.1% | 0.000 |
| Weight-for-height | 2.4% | 2.2% | 0.697 |

* Number of deaths that occurred among the mothers divided by the number of live children in each comparison group.

### 3.7.5 Health and Knowledge of Sound Environmental Practices

The items that make up the environmental index appear in Table 28, and questions B18-B19. Those mothers with a more sound knowledge of good environmental practices have children with less diarrhea (prevalence), lower mortality (childhood), and better nutritional status (weight and height) than mothers with less sound knowledge of the environment. These differences in health are equivalent to a 23-percent reduction in 24-hour prevalence of diarrhea, a 39-percent reduction in childhood mortality, an 8-percent reduction in percent of underweight children, and a 5-percent reduction in stunting.

**Table 28: Health Outcomes by Differences in Knowledge of Environmentally Sound Practices**

| | COMPARISON GROUP | | |
|---|---|---|---|
| HEALTH OUTCOME | Lower Median (N = 1,715) | Upper Median (N = 1,536) | P-VALUE |
| Diarrhea | | | |
| 2-week recall | 13.1% | 10.1% | 0.007 |
| 24-hour recall | 6.4% | 5.6% | 0.329 |
| Duration | 5.6 days | 5.4 days | 0.597 |
| Mortality rate/1000 live births* | | | |
| Infant (0-11 months) | 80.1 | 84.5 | 0.661 |
| 1-5 (12-60 months) | 19.3 | 11.8 | 0.093 |
| Child (0-60 months) | 99.4 | 96.4 | 0.788 |
| Anthropometry (<-2 SD) | | | |
| Weight-for-age | 46.5% | 42.9% | 0.040 |
| Height-for-age | 71.8% | 68.1% | 0.020 |
| Weight-for-height | 2.1% | 2.4% | 0.548 |

* Number of deaths that occurred among the mothers divided by the number of live children in each comparison group.

### 3.7.6 Health and Latrine Characteristics

The items in the latrine index appear in Table 29. Communities with latrines in good condition had children with significantly better nutritional status than those without latrines or with latrines not in good working order. Despite less diarrhea and mortality in the upper median compared to the lower median, the differences were not statistically significant. For example, the reduction in diarrhea prevalence (24-hour) was 11 percent, and in mortality (infants) 10 percent. For

weight-for-age, the reduction was 10 percent and for height-for-age it was 8 percent, both of which were statistically significant.

**Table 29: Health Outcomes by Differences in Latrine Characteristics**

| | COMPARISON GROUP | | |
|---|---|---|---|
| **HEALTH OUTCOME** | **Lower Median (N = 1,750)** | **Upper Median (N = 1,482)** | **P-VALUE** |
| Diarrhea | | | |
| 2-week recall | 12.3% | 10.9% | 0.198 |
| 24-hour recall | 6.2% | 5.8% | 0.642 |
| Duration | 5.5 days | 5.6 days | 0.770 |
| Mortality rate/1000 live births* | | | |
| Infant (0-11 months) | 86.3 | 77.4 | 0.387 |
| 1-5 (11-60 months) | 16.0 | 15.4 | 0.909 |
| Child (0-60 months) | 102.2 | 92.9 | 0.405 |
| Anthropometry (<-2 SD) | | | |
| Weight-for-age | 47.0% | 42.1% | 0.006 |
| Height-for-age | 72.6% | 67.0% | 0.000 |
| Weight-for-height | 1.8% | 2.8% | 0.076 |

* Number of deaths that occurred among the mothers divided by the number of live children in each comparison group.

## Chapter 4

# CONCLUSIONS AND RECOMMENDATIONS

## 4.1 Conclusions

The conclusions that follow are divided into three categories. The first is a summary of the characteristics of the overall sample, without regard for the two groups that will be compared during the follow-up evaluations. The second summarizes the comparison of the intervention and control group of communities. The third is a summary of the analysis of those with high versus low levels of knowledge, attitudes, and practices in relation to health outcomes. For the first two categories, the conclusions are divided into three general subcategories: SES, KAP, and health conditions. For the third category, several KAP indices and SES were compared to the health status of children.

### 4.1.1 Characteristics of the Overall Sample

1. The sample appears to be representative of the Highland population. The people are poor with few assets, uneducated with a high proportion of illiterate mothers, and remote from roads and towns. They have large families with 1.8 children under five per family.

2. People's knowledge of how to prevent diarrhea is scant. They possess a general awareness that a clean environment is important, but they know little about specific practices that could prevent diarrhea.

3. Although it appears that the importance of hand washing is understood, much remains to be done to disseminate proper hand washing techniques. Also, few mothers reported the need to wash hands after handling fecal material.

4. People live in relatively unclean households, with animals frequently found in homes. Although some people know how to dispose of feces properly, the connection between fecal matter and disease may not be well understood.

5. A majority of households already have latrines in their home. Most of those that have a latrine do make use of it and maintain it adequately, and most report that everyone from the household defecates there. The quality of the construction of the latrines leaves much to be desired, however.

6. Knowledge of ORS and feeding during diarrhea is good. Use of and knowledge of ORS packets was better than that for home-made solutions.

7. None of the villages in our sample had an adequate or a sufficient year-round water supply. A variety of situations existed but, in general, the vast majority of all residents most likely relied on contaminated and insufficient water.

8. The health of the population is not good. High rates of malnutrition exist and diarrhea and respiratory episodes are common. About 15 percent of children will have diarrhea in a given two-week period, and 25 percent will have a cough on any given day. Infant deaths are common, with about 75 children dying out of every 1,000 live births. About 70 percent of children are considered to be moderately or severely stunted.

9. In conclusion, there is much potential to increase people's knowledge of health-related practices, improve their hygiene-related behaviors, and reduce levels of morbidity, mortality, and malnutrition.

### 4.1.2 Comparability of Intervention and Control Communities

Overall, the intervention and control communities were comparable with respect to most indicators measured in the baseline survey, and we can state with confidence that they are representative of the same population. The matching of controls with interventions was thus successful.

1. The social, demographic, and economic situation between the two groups was the same. The two groups of communities can be considered to have come from the same larger population. This implies that results based on this five-year project can be (1) due to the intervention and not to differences between groups and (2) extrapolated to other Highland communities.

2. People's knowledge, attitudes, and practices about health-related matters were also similar across the comparison groups. When a particular piece of knowledge or a practice was high in the control communities, it was also high in the intervention communities. The same was true when rates of knowledge or practice was low. In most cases the difference in percent for a certain piece of knowledge across intervention and comparison groups was within 1-5 percentage points of each other. This implies not only that the groups are similar but also that no bias occurred in how mothers responded or enumerators observed conditions between groups.

3. For any particular category (e.g., knowledge of diarrhea treatment), the range of knowledge varied widely in the total sample, but the relative ranking of items within a particular category was identical in both groups of communities. This was true of all items in the questionnaire. In other words, people consistently gave similar answers to similar questions, whether they were intervention or control participants.

4. For each of the major health outcomes—diarrhea, mortality, and nutritional status—the intervention and control community children have the same health status. No statistical differences were found for any of these outcomes. No overall trend was observed. For example, point prevalence of diarrhea was less in the intervention group, but period prevalence was higher in the control communities. For height-for-age, Z-scores were better in the intervention group, but the percent below -2.0 Z-scores was lower in the control community. This same type of reversal was found for infant and child mortality. All of the

differences were small, and these reversals in the directions of the effect for any one outcome indicate identical samples regarding health outcomes.

### 4.1.3 Comparison of KAP and Health Outcomes

Because the comparison of the intervention and control communities revealed no differences in health and because results from the SES, KAP, and observation parts of the baseline survey indicated wide variability, health outcomes were examined in relation to SES, KAP, and observations. This was done to determine the potential direction of the health status following the intervention and estimate the magnitude of the health improvements. Within broad categories (e.g., observed household cleanliness) the sample was divided into two equal groups, those with higher (better) and those with lower (worse) levels of knowledge and practices of hygiene.

1. People with better living conditions (e.g., more economic assets and higher education) had children with better health than those people whose living conditions place them in a more impoverished condition. This was true for diarrhea, nutritional status, and mortality.

2. Better knowledge about how to prevent diarrhea was associated with less diarrhea, lower mortality, and better nutritional status. For diarrhea, the difference was mostly in the duration rather than the prevalence of diarrhea. For mortality, the difference was found mostly among infants, not older children. Both stunting and underweight, but not wasting, was lower among mothers with better knowledge of prevention of diarrhea than mothers with little knowledge of prevention.

3. For knowledge of disease prevention, no relationship was found with diarrhea morbidity. Mortality, however was lower among those with more knowledge of treatment compared to those with less knowledge. The same was true for nutritional status, but the improvements in health had a greater effect on mortality than on nutritional status.

4. Those with cleaner households and environments, as measured by observations, had less child mortality and better nutritional status than those with households that appeared to be unclean. No differences were found for diarrhea or infant mortality.

5. Among those with a greater knowledge of sound environmental practices, children had less malnutrition than those with low knowledge of sound environmental practices. Only point prevalence of diarrhea and infant mortality was less among the more knowledgeable group, but the differences were small, particularly compared to the differences for knowledge of how to prevent and treat diarrhea.

6. Among those with latrines in good working order, the children were less malnourished than among those without latrines or with latrines in poor working condition. Differences, however, were only found for nutritional status, not morbidity or mortality.

7. The results presented in this section all concur in showing the potential for health improvement through health education. This suggests that mothers in the intervention communities, the majority of whom presently have relatively low levels of health-related

knowledge and correspondingly low levels of adequate health practices, will be able to improve measurably the health of their children following PAYSA's health education intervention.

## 4.2 Recommendations

The recommendations are divided into three categories. The first group of recommendations pertains to the PAYSA project. There are two subcategories addressed in this section. One is the content and messages of PAYSA's health education component of the project, particularly the prioritization of specific messages. The second part pertains to how PAYSA introduces health agents in the communities, implements health messages, particularly the encouragement of positive practices and the promotion of new knowledge and practices. The second category of recommendations focuses on the mid-term evaluation and the monitoring system. The third category focuses on the issues that should be considered during the final evaluation. In this third and final category, we again divide the recommendations into three subcategories: timing of the evaluation, the survey/field work process, and analysis of data.

### 4.2.1 Recommendations to the PAYSA Project

The recommendations to the PAYSA project are divided into several sections. First is a general list of recommendations on topic categories that should receive priority over other categories. Second, is a list of specific actions that should be reinforced and encouraged, actions that should be introduced and promoted vigorously, and actions that could be detrimental and should be ended.

#### 4.2.1.1 Recommendations Concerning the Prioritization of Messages

When comparing the results from the survey to the goals stated by PAYSA (Section 1.3 of this report) the following aspects emerge as priority areas of interventions.

Only about half of the mothers knew three or more causes of diarrhea. Enlarging theoretical knowledge so that mothers know of more ways to deter diarrhea is an important step in promoting better health.

To improve a mother's skills in preventing diarrhea, the following specific recommendations are made:

1. Promote hand washing, especially in relation to contact with fecal material (e.g., child or own stools, diapers) through teaching of correct methods (e.g., running water, soap, and drying hands) and actual demonstrations by the volunteer.

2. Promote proper garbage disposal. Notwithstanding the importance of proper garbage disposal in the process of controlling diarrhea, the data showed we are very far from the goal of 80

percent of the families correctly disposing of their garbage: only one third of the sampled households dispose of their garbage correctly. It is our impression that the teaching of composting as a primary method of garbage disposal would economically benefit the household; and thus composting might have more appeal and the capacity for long-term adoption.

3. Promote the importance of corralling of animals. Prior to that, however, it would be useful to do a sub-study to identify and try out different techniques for corralling animals that would be inexpensive and acceptable to the population. In this study, include families that do and do not corral animals.

4. Promote the concept of food contamination and its relation to disease propagation. Insist particularly on hand-to-mouth contamination and make the link with hand washing, particularly in relation to fecal matter. Also introduce the idea of contamination through drinking water, dirty objects, and other means.

5. Reinforce knowledge of environmental protection. Because this is not clearly related to health outcomes, however, it should receive less attention than the more pressing issues related to personal and domestic hygiene.

To improve a mother's skill in treating diarrhea, particular areas and levels of intervention can be specified out of the data obtained:

1. Positive reinforcement of feeding practices (breastfeeding and feeding of non-breastmilk) during diarrhea episodes.

2. Promote the use of ORS packets among mothers, ensuring at the same time that there is continuous availability of the packets through volunteers.

3 Dedicate less effort on teaching home-made ORS; and when taught, warn mothers of the potential ill effects of a badly made ORS preparation.

#### 4.2.1.2 Recommendations Concerning the Promotion of Messages

Health agents have little experience in these communities, yet they are central to the success of the health education component of the intervention. It is critical that the correct relations with the community be established. Therefore, efforts should be made to help the community to feel so positive about the health education messages that they will make them daily practices. Once this kind of rapport is established, basic health education messages should be complemented with specific messages, demonstrations, and reinforcement.

### 4.2.2 Recommendations for the Mid-Term Evaluation

The rationale for doing the mid-term health impact evaluation should be re-thought. Originally, it was scheduled for 1994. To keep the same season, that would mean a mid-term evaluation in early 1994. There are two good reasons for not doing a mid-term health impact study, as was originally scheduled. First, the baseline study could not be conducted before 1993, that is, one year (and not two as initially planned) before the mid-term evaluations. The time this leaves between the introduction of the intervention components and the date for a mid-term evaluation is insufficient to measure substantial health benefits. There is not enough time for a change in health education practices to produce changes in health. Second, the success of the intervention should be guaranteed prior to the measurement of health impact.

Therefore, we recommend a process rather than a health impact evaluation. The processes that need evaluation are (1) the quality of the health education intervention and (2) the ability of the monitoring system to provide maximum impact from the education component. The two sections in this category discuss issues about the evaluation of the process of the intervention and the evaluation of the monitoring system.

#### 4.2.2.1 Evaluation of the Promoters and the Quality of Educational Components

The mid-term evaluation should be used in part to assess the quality of the health education intervention. In this regard, both the ability of the promoters and the mothers who interact with the promoters should be evaluated. Rather than conduct a process evaluation of all intervention communities, a random subsample could be selected.

#### 4.2.2.2 Evaluation of the Monitoring System

The monitoring system should be evaluated at mid-term. The success of the monitoring system can be evaluated by reviewing the forms and interviewing promoters (individuals). Questions C01-C26, which were used in the baseline survey for monitoring observations, should be used. Specific messages that were developed by the CARE project were very similar to the observation data developed and used in the baseline survey. The process developed by the CARE project used a pictorial method to assess progress in the community. The evaluation should focus on observations rather than interviews of families. The CARE instruments could be adapted to monitor overall progress.

To evaluate and monitor the work of the promoters, questions B22-B26 would be appropriate. A skilled person should be designated for the task of monitoring, someone who can organize, process, analyze, and interpret the evaluation results.

### 4.2.3 Final Evaluation

Issues related to the final evaluation are divided into three sections: the timing of the evaluation, recommendations for field work and the survey, and plans for analysis of data.

#### 4.2.3.1 Recommendations on the Timing of Final Evaluation

So that seasonal differences do not interfere with the interpretation of the results of the health impact evaluation, the final evaluation should be conducted from January to April. Because the evaluation includes a measure of mortality, which has a four-year recall period, consideration should be given to conducting the final evaluation during 1997 instead of 1996. We realize that the project is designed to end during 1996, but the evaluation during 1997 would allow for a longer duration for the intervention to be incorporated into people's daily lives and allow for a good measure of mortality without altering the protocol and inference ability.

#### 4.2.3.2 Recommendations Concerning the Field Work and Survey

1. The questionnaire used for the baseline survey should be used for the follow-up survey, along with its accompanying materials (e.g., code books, enumerators' manuals, and data entry process). Two advantages exist for keeping the same questionnaire: parts of the questionnaire were developed for use only during the follow-up surveys, and the comparison over time will be easier if the same questions are asked, coded, and transformed in the same manner.

2. All of the basic information on communities, families, and children should be obtained as well during the follow-up survey. For example, the data for type of roof, educational level of respondents, and other characteristics should be obtained. All three health outcomes should be measured in the same manner.

3. Effort should be made to determine if all communities are appropriate and available to be included in the follow-up survey. If they are not, an anthropologist should be consulted to identify appropriate alternate communities. An epidemiologist/statistician should also be consulted to recalculate the power of the tests on the health effects.

#### 4.2.3.3 Recommendations Concerning the Analysis of Follow-Up Data

1. The epidemiologist/statistician should be consulted for advice on how to do the analyses, and a sociologist should be consulted for help in creating indices from KAP and observational data.

2. When data are analyzed at the time of the follow-up, the differences in health found at follow-up should be controlled for any differences that occurred from baseline to follow-up within each comparison group as well as differences across comparison groups at the time

of the follow-up. In addition, differences in SES across families and children should be controlled in the analyses.

3. If the final evaluation occurs in 1996, it will only include a maximum of three years of project experience. If this happens, consideration should be given to the need for data on child mortality. If these data are still desired, time should be given to a suitable change in protocol for measuring childhood mortality. Diarrhea morbidity and nutritional status should be collected in the identical manner as was done in the baseline survey.

4. Future analyses should include multivariate models to control for socioeconomic status when testing the association between maternal knowledge and practices and children's health outcomes.

5. Analyses should also stratify by children's age groups to test whether the magnitude of the associations between maternal knowledge and practices and child health outcomes differ according to children's age. This has been shown to occur in various studies around the world. In general, the positive effects of maternal knowledge, practices, and schooling are stronger among younger children.

6. One further index should be derived that would sum up all the sub-indices created under the general domain of "diarrhea management." Relating this overall indicator with health outcomes would potentially demonstrate the need for a comprehensive, versus a piecemeal, approach to health and nutrition education.

Before the follow-up survey takes place, the consultation of two types of people should be considered by the PAYSA project people and USAID/Guatemala. First, it should be determined that the intervention and control communities are still available and appropriate for use in the final evaluation. If they are not, an epidemiologist/statistician should be consulted to recalculate the number of communities necessary to show differences in health given the values found and baseline. An anthropologist should be consulted to identify appropriate communities in order to replace control communities that were lost for whatever reason.

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## APPENDICES

1. SCOPE OF WORK
2. LIST OF COMMUNITIES
3. QUESTIONNAIRE FORM
4. COMMUNITY PROFILE FORM
5. DESCRIPTION OF KAP INDICES
6. SCHEDULE OF ACTIVITIES
7. PERSONNEL INVOLVED
8. OTHER DOCUMENTATION NOT IN THIS REPORT

**Appendix 1**

# SCOPE OF WORK

The Highlands Water and Sanitation Project was designed to achieve a sustained improvement in the health status of the rural Guatemalan poor through the provision of potable water, latrines, and sanitary and health education. The project will be carried out as an integrated effort of the participating communities, the Government of Guatemala (GOG), and USAID/Guatemala. The evaluation plan of the project includes a baseline, a mid-term, and a final evaluation. The scope of work described in this PIO/T is for a baseline study that will provide data on the target communities prior to the implementation of project interventions regarding: infant and child mortality rates, incidence of diarrheal disease, and knowledge, attitude, and practices.

On August 27, 1991 a grant agreement was signed between USAID/Guatemala and the GOG to carry out a water and sanitation project in the Guatemalan Highlands. The Highlands Water and Sanitation Project No. 520-0399 is a five-year project designed to achieve a sustained improvement in the health status of the rural poor in the highlands of Guatemala through reduction of diarrhea diseases. Two preventive health interventions will be combined to achieve project goal and objectives: (1) construction of 200 potable water systems and 24,000 latrines, and (2) sanitary/health education. These interventions will be carried out in 300 rural communities (with populations of from 200 to 1,200 persons) of six departments of the Western Highlands. Owing to their small size and distance from the nearest towns, generally no health services will be found in these communities. This project will be operating in the Department of Quetzaltenango, San Marcos, Huehuetenango, Quiche, Solola, and Totonicapan, located in the Southwestern, and Northwestern regions of the country. These areas were selected because of the high incidence and prevalence of diarrheal disease, the high rates of child and infant mortality, the high percentage of poor populations lack of services, and community interest in project activities. In addition, there is a considerable existing infrastructure left in place left by the previous project, The Community Based Integrated Health and Nutrition Systems.

## Appendix 2

# LIST OF COMMUNITIES

### Work Group no. 1 (area Quiche)

**Matched communities**

| Group | t: Treatment (n) | c1: Control 1 (n) | c2: Control 2 (n) | t:c1+c2 (Ratio) |
|---|---|---|---|---|
| 1 | Chuijox Pachoc, Totonicapan (25) | Media Cuesta Totonicapan (15) | Chi Garcia, Totonicapan (25) | 25:40 (1.6) |
| 2 | Choqui, SanBartolo A.C, Totonicapan (61) | Cieneguilla, Malacatancito, Huehue (32) | Paniya, Malacat (25) Chiaque Malacat (38) | 61:95 (1.56) |
| 3 | Panimatzalam, Solola (60) | Xequistel, Solola (60) | Chipop, Solola (61) | 60:121 (2.02) |
| 4 | Chijurunja Xesana Totonicapan (20) | Chiuz, Xesana, Totonicapan (17) | Chuisiguan, Xesana, Totonicapan (23) | 20:40 (2) |
| 5 | Pamalin Totonicapan (40) | Xelajab/Chui Pachec, Toto (20) Panima, Totonicapan (5) Chitax, Totonicapan (1) | Patzite, Totonicapan (26) Puue Ruiej, Toto (6) Chonimabaj, Toto (32) | 40:90 (2.25) |
| 6 | Los Castro, Solola (36) | Los Chopen, Solola (18) Chaquiya, Solola (18) | Los Julajuj Solola (24) | 36:60 (1.67) |
| 7* | Muculinquiaj, Joyabaj, Quiche (42) | Azucenas, Joyabaj, Quiche (40) | El Cipres, Joyabaj, Quiche (21) | 42:61 (1.45) |
| 8 | Tululche, Chiche, Quiche (79) | San Francisco Chiche, Quiche (17) | San Antonio Sinache, Quiche (22) | 79:39 (0.49) |
| Total | 363 | 243 | 303 | 363:546 (1.5) |

* The community of Las Azucenas, listed here as a control community, in fact appears on PAYSA's list for project construction for the year 1994. The reason for including it as control rather than treatment was to complete the requirements of this group as of control. Appropriate communities had been selected in the vicinity of Muculinquiaj and Las Azucenas to serve as controls, but severe political problems in these control villages impeded the field work. The *municipio* of Joyabaj has suffered a great deal of political violence in the last years, and our team of enumerators was perceived as a threat and was refused entry in four villages. The *jefe de patrulla* with whom we had

made arrangements had been killed a few days before our visit. Project investigators decided to eliminate these controls, but in order not to lose fieldwork that had been done in Muculinquiaj, and Las Azucenas, we decided to pair the latter to the former as a control. The consequence will be that we will "lose" the control for the follow-up, i.e., we will need to find another control to replace it. This situation is expected to repeat itself for many other controls, however. In that sense, using Azucenas as a control just adds it to the list of controls to be replaced. It does not invalidate the data presented here.

# LIST OF COMMUNITIES

**Work Group no. 2 (area MAM)**

| Matched communities | | | | |
|---|---|---|---|---|
| **Group** | **t: Treatment (n)** | **c1: Control 1 (n)** | **c2: Control 2 (n)** | **'t:c1 + c 2 (Ratio)** |
| 11 | Guayabitas, Chiantla, Huehuet (13) | Los Manzanillos, Aguacatan, Huehuet (19) | Chuluves, Chiantla, Huehuet (20) | 13:39 (3.0) |
| 12 | Buenos Aires Cantinil Chiantla, Huehuet (40) | Las Lomas Tajumuc, Chiantla, Huehuet. (30) | El Rincon Tajumuc, Chiantla, Huehuet (37) | 40:67 (1.68) |
| 13 | Los Chujes Tajumuc, Chiantla, Huehuet. (40) | Los Regadillos Tajumuc, Chiantla, Huehuet (35) | La Tejera Tajumuc, Chiantla, Huehuet (24) | 40:59 (1.48) |
| 14 | La Cumbre Sibilia, Quetzaltenango (20) | El Rincon Sibilia, Quetzaltenango (20) | ChuiStancia-Zanjuyup, Sibilia, Quetzaltenango (19) | 20:39 (1.95) |
| 15 | La Union, Ojetenam San Marcos (26) | Tuimay, Ojetenam San Marcos (26) | Guadalupe, Ojetenam, San Marcos (34) | 26:60 (2.3) |
| 16 | Legual, Ixtahuacan, San Marcos (40) | Tuicampana, Ixtahuacan, San Marcos (28) | Esperanza, Ixtahuacan, San Marcos (39) | 40:67 (1.68) |
| 17 | Ixcuen, Democracia, Huehuetenango (105) | La Ceiba, Democracia, Huehuetenango (37) | La Reforma, Democracia, Huehuetenango (60) | 105:97 (0.92) |
| 18 | Xepon Centro, Totonicapan (25) | Las Joyas Kankabal, Malacat, Huehuet (30) | Kankabal Centro Malacat, Huehuet (30) | 25:60 (2.4) |
| 19 | Chipilines, Xepon, Totonicapan (26) | Sunul, San Lorenzo, Malacat, Huehuet (27) | La Unidad Capellania, Chiantla, Huehuet (41) | 26:68 (2.6) |
| 20 | Los Cipreses, Xepon Totonicapan (24) | Las Moras Kiek'Suya Totonicapan (25) | Kiek'Suya Centro, Totonicapan (28) | 24:53 (2.2) |
| **Total** | **359** | **277** | **332** | **359:609 (1.7)** |

**Appendix 3**

# QUESTIONNAIRE FORM

CODIGO FAMILIA _____

PAYSA
BOLETA EVALUACION LINEA BASAL
HOJA DE VIVIENDA

A01. Departamento _____ Comunidad _____ _____(A01)

A02. Fecha entrevista _____/_____/_____ _____(A02)

A03. Encuestadora _____ _____(A03)

A04. Idioma de la entrevista _____ _____(A04)
(1 Quiche; 2 Mam, 3 Castellano, 4 Otro)

A05. Persona entrevistada (ver codigos): _____(A05)

A06. Jefe Familiar: Nombre _____ _____(A06)

A07. Occupacion principal: _____ _____(A07)

A08. Ocupacion secundaria _____ _____(A08)

A09. Edad _____ _____(A09)

A10. Estado civil. _____ _____(A10)
(1 Casado, 2 Unido 3 Soltero, 4 Separado divorciado, 5 Viudo, 6 Otro)

A11 Escolaridad _____(A11)

| No | Nombre | Est. civil (ver cod) | Rel con jefe (ver cod) | Edad | Ocup prim. (ver cod.) | Ocup sec. (ver cod.) | Esc | Total Num. Ninos nacido vivos | Tot. ninop er-dido | Edad Ninos < 5 muertos en ultimos 4 anos | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 1 | 2 | 3 |
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |

A12 La madre # 1 sabe leer (ensenar tarjeta)(0=no; 1=si) _____ _____(A12)

A13 Cuantas familias viven en la casa? _____ _____(A13)

A14 Cuantas personas viven en la casa? _____ _____(A14)

A15. Cuantos ninos menores de 5 anos viven en la casa? _____(A15)

A16 Cuantos cuartos hay en la casa? _____ _____(A16)

A17. Tiene luz electrica en la vivienda? (0=no; 1=si) _____ _____(A17)

A18 Tiene cocina separada? (0=no; 1=si) _____ _____(A18)

Techo _____(A19)
1 Paja/palma
2 Teja
3 Lamina
4 Madera
5 Terraza
6 Otros

Piso _____(A20)
1 Tierra
2 Torta/cemento
3 Madera
4 Ladrillo/Barro
5 Mosaico
6 Otros

Pared _____(A21)
1 Cana, Pajon
2 Bajareque
3. Adobe
4 Madera
5 Blocks/Ladrillos
6 Otros

_____(A19)
_____(A20)
_____(A21)

A22 Bicicl _____ Moto _____ Carro/pickup _____ _____(A22)

A23. Caballo _____ Mula _____ Toro/vaca _____ Coches_____ _____(A23)

A24 Radio _____ T V _____ Refri _____ Estuf. de gas _____ _____(A24)

A25 Roper _____ Amue _____ Cama _____ Mesa _____ _____(A25)

A26 Cuales son las estaciones de radio que mas escucha (mas importante primera) _____(A26)

NUMERO DE FAMILIA _____

PAYSA
BOLETA EVALUACION-LINEA BASAL
CONOCIMIENTOS, ACTITUDES, PRACTICAS

B) CONOCIMIENTOS/ACTITUDES

| | | | | |
|---|---|---|---|---|
| B01. | Por que cree ud. que a los ninos les da asientos? (0=no menciona; 1=si menciona) | - No sabe | _____(B01A) | _____(B01A) |
| | | - Tomar agua sucia | _____(B01B) | _____(B01B) |
| | | - Madre tiene los manos sucias | _____(B01C) | _____(B01C) |
| | | - Nino come alimentos sucios/pasados/mal cocidos | _____(B01D) | _____(B01D) |
| | | - Nino come en trastos sucios | _____(B01E) | _____(B01E) |
| | | - Nino come cosas sucias | _____(B01F) | _____(B01F) |
| | | - Falta de higiena/limpieza en el nino | _____(B01G) | _____(B01G) |
| | | - Falta de higiena/limpieza en el hogar | _____(B01H) | _____(B01H) |
| | | - Otros1 (indicar)_____ | _____(B01I) | _____(B01I) |
| | | - Otros2 (indicar)_____ | _____(B01J) | _____(B01J) |
| B02. | Hay algunas formas de evitar que sus ninos tengan asientos varias veces? (0=No hay; 1=Si hay; 9=No sabe) | | _____(B02) | _____(B02) |
| B03i | Si hay, cuales son? (0=no menciona; 1=si meniona) | - Mantener la casa limpia/ordenada | _____(B03A) | _____(B03A) |
| | | - Lavado de manos-madre | _____(B03B) | _____(B03B) |
| B03ii. | Aqui en su casa, hay algunas mejoras que ud. puede hacer para arreglar su casa para evitarle enfermedades a sus ninos? | - Lavado de manos-nino | _____(B03C) | _____(B03C) |
| | | - Lavar los trastos | _____(B03D) | _____(B03D) |
| | | - Usar la letrina | _____(B03E) | _____(B03E) |
| | | - Lavar bien los alimentos | _____(B03F) | _____(B03F) |
| B03iii | Si ud. tuviera dinero, que cosas haria a su casa para evitarle enfermedades a sus ninos? | -Cocer bien los alimentos | _____(B03G) | _____(B03G) |
| | | - Tapar la comida | _____(B03H) | _____(B03H) |
| | | - Tapar el agua de tomar | _____(B03I) | _____(B03I) |
| | | - Hervir el agua de tomar | _____(B03J) | _____(B03J) |
| | | - No comer/servir alimentos descompuestos | _____(B03K) | _____(B03K) |
| | | - Mantener los animales fuera/encerrados | _____(B03L) | _____(B03L) |
| | | - Disponer de basura adecuadamente/con bote tapado | _____(B03M) | _____(B03M) |
| | | Encalar la casa | _____(B03N) | _____(B03N) |
| | | - Poner cedazo en ventanas | _____(B03O) | _____(B03O) |
| | | - Dejar entrar la luz | _____(B03P) | _____(B03P) |
| | | - Construir cocina separada | _____(B03Q) | _____(B03Q) |
| | | - Cemento torta en piso/piso formal | _____(B03R) | _____(B03R) |
| | | - Evitar/eliminar charcos | _____(B03S) | _____(B03S) |
| | | - Otros1 (indicar)_____ | _____(B03T) | _____(B03T) |
| | | - Otros2 (indicar)_____ | _____(B03U) | _____(B03U) |
| B04. | Cuando tenemos que lavarnos las manos? (0=no menciona, 1=si menciona) | - No sabe | _____(B04A) | _____(B04A) |
| | | - Antes de comer | _____(B04B) | _____(B04B) |
| | | - Antes de cocinar | _____(B04C) | _____(B04C) |
| | | - Despues de usar letrina | _____(B04D) | _____(B04D) |
| | | - Antes de dar de mamar | _____(B04E) | _____(B04E) |
| | | - Despues cambiar panales | _____(B04F) | _____(B04F) |
| | | - Otros (indicar)_____ | _____(B04G) | _____(B04G) |
| B05. | Nos puede ensenar como se lava las manos? (0=no menciona; 1=si menciona) | - No quiere | _____(B05A) | _____(B05A) |
| | | - Usa agua que cae | _____(B05B) | _____(B05B) |
| | | - Usa jabon o ceniza | _____(B05C) | _____(B05C) |
| | | - Usa trapo limpio, se seca al aire | _____(B05D) | _____(B05D) |
| B06. | Segun su opinion, es mejor seguir dando de mamar al nino con asientos, o no seguir dando de mamar a este nino? (0=No, 1=Si, 9=NS) | | _____(B06) | _____(B06) |
| B07. | Segun su opinion, es mejor seguir dando de comer al nino con asientos o no seguir dando de comer a este nino? (0=No, 1=Si, 9=NS) | | _____(B07) | _____(B07) |
| B08. | Conoce esto (Mostrar sobre de SRO)(0=No, 1=Si) | | _____(B08) | _____(B08) |
| B09. | Para que sirve? (escribir respuesta) _____ | | _____(B09) | _____(B09) |
| B10. | Y lo ha usado alguna vez?(0=No, 1=Si) | | _____(B10) | _____(B10) |
| B11 | Y la ultima vez que su nino tuvo asientos, lo uso? (0=No, 1=Si) | | _____(B11) | _____(B11) |

NUMERO DE FAMILIA _____

PAYSA
BOLETA EVALUACION-LINEA BASAL
CONOCIMIENTOS, ACTITUDES, PRACTICAS

C) OBSERVACIONES

| | | | |
|---|---|---|---|
| CASA: | | | |
| C1. | La comida esta tapada? | _____(C01) | _____(C01) |
| C2. | El agua almacenada para tomar esta tapada? | _____(C02) | _____(C02) |
| C3. | Los trastos estan limpios, tapados/guardados? | _____(C03) | _____(C03) |
| C4. | El suelo de la casa esta limpio, sin popo o excrementos? | _____(C04) | _____(C04) |
| C5. | El suelo de la casa esta limpio, sin basura? | _____(C05) | _____(C05) |
| C6. | El suelo del patio esta limpio, sin popo o excrementos? | _____(C06) | _____(C06) |
| C7. | No hay panales sucios a la vista? | _____(C07) | _____(C07) |
| C8. | El suelo del patio esta limpio, sin basura? | _____(C08) | _____(C08) |
| C9. | Los animales estan fuera de la casa? | _____(C09) | _____(C09) |
| C10. | Los animales estan amarrados o encerrados? | _____(C10) | _____(C10) |
| C11. | La madre tiene las manos limpios? | _____(C11) | _____(C11) |
| LETRINA (si hay) | | | |
| C12. | Donde va ud. a hacer sus necesidades? (1 = Bosque/monte, 2 = Rio, 3 = Letrina, 4 = Inodoro, 5 = Letr publica, 9 = N/A) | _____(C12) | _____(C12) |
| C13 | Tiene letrina? | _____(C13) | _____(C13) |
| C14. | Si tiene, quienes la usan? 1: Todos, 2: Solo adultos, 3, Solo ninos, 4: Algunos (quienes) | _____(C14) | _____(C14) |
| C15. | La letrina tiene paredes, caseta? | _____(C15) | _____(C15) |
| C16. | La letrina tiene techo? | _____(C16) | _____(C16) |
| C17. | La letrina tiene puerta? | _____(C17) | _____(C17) |
| C18. | La puerta de la letrina esta cerrada? | _____(C18) | _____(C18) |
| C19. | La taza de la letrina esta tapada? | _____(C19) | _____(C19) |
| C20. | La letrina esta limpia (sin materiales de limpieza ni heces?) | _____(C20) | _____(C20) |
| C21. | La letrina evidencia uso? (taza manchada/gastada, olor, materiales de limpieza) | _____(C21) | _____(C21) |
| C22. | La letrina tiene olor moderado? | _____(C22) | _____(C22) |
| AGUA | | | |
| C23. | Donde recoge su agua potable?<br>1 Rio/lago<br>2 Pozo superficial en comunidad/terreno<br>3 Manantial/nacimiento<br>4 Pila o chorro publico/Llenacantaros<br>5 Manguera, poliducto a casa<br>6 Pozo en casa<br>7 Chorro domiciliar<br>9 N/A | _____(C23) | _____(C23) |
| C24 | Si hay chorro domiciliar, sale agua del chorro ahora? | _____(C24) | _____(C24) |
| C25 | Si hay chorro domiciliar, la llave del chorro cierre bien? | _____(C25) | _____(C25) |
| C26 | Las aguas de desperdicios drenan bien? (no charco, no lodo) | _____(C26) | _____(C26) |

**PAYSA - LINEA BASAL**

**ANTROPOMETRIA Y MORBILIDAD DE NINOS MENORES DE 5 ANOS DE EDAD**

Numero de familia _____

| Nino # | Madre | Nombre | Fecha nacimiento | Sexo | Sintomas gastro-intestinales | | | | | | | | | | Sintomas respiratorios | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Asientos | | Moco y/o sangre | | Vomitos | | Severidad | | Secrecion nasal | | Tos productiva | | Fatiga y/o hervor de pecho | | Severidad | |
| | | | dd/mm/aa | 1:M 2 F | Desde cuando | Cuanto duro | Desde cuando | Cuanto duro | Desde cuando | Cuanto duro | 0. No sintomas 1. Anorexia/Apatia 2. Fiebre 3. 1 y 2 | | Desde cuando | Cuanto duro | Desde cuando | Cuanto duro | Desde cuando | Cuanto duro | 0. No sintomas 1. Anorexia/Apatia 2. Fiebre 3. 1 y 2 | |
| 1 | | | / / | | | | | | | | | | | | | | | | | |
| 2 | | | / / | | | | | | | | | | | | | | | | | |
| 3 | | | / / | | | | | | | | | | | | | | | | | |
| 4 | | | / / | | | | | | | | | | | | | | | | | |
| 5 | | | / / | | | | | | | | | | | | | | | | | |
| 6 | | | / / | | | | | | | | | | | | | | | | | |

C: Desde cuando:
1: Ahora (hoy)
2: Solo esta semana (ahora no)
3: La semana pasada (ahora no, pero puede haber tenido esta semana)

D: Cuanto duro
0: Menos de 1 dia
1-8: Numero de dias exacto
9: Más de 8 dias

| Nino # | Sintomas nutricionales | | Sintomas infecto-contagiosos | | Otros | | | Vacunación 0: No 1: SI | | | | Antropometria | | | Alimentación | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Edema | Aspecto esqueletico | Tipo (ver cód ) | Desde cuando | Especif. nombre | Cód. | Desde cuando | BCG (1) | DPT (3) | POL. (3) | SARAMP (1) | Peso nino | Peso ropa | Talla /longitud | Patrón de lactancia ahora | A que edad empezo a recibir algo mas que solo pecho ? | A que edad se paro de recibir pecho? |
| | | | | | | | | | | | | | | | 1.Solo pecho 2.Pecho/liquidos 3.Pecho/liq/solid. 3 Solo solidos | | |
| 1 | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |

Códigos

Tipo Enfermedad infecto- contagiosa
0 Ninguna
1. Sarampión
2. Rubiola
3. Varicela
4 Paperas
5 Tosferina
6. Tetanos
7. Hepatitis
8. Otro (indicar)
9 No sabe nombre

Comentarios.

**Appendix 4**

# COMMUNITY PROFILE FORM

**Cuestionario sobre Comunidades**

**Proyecto de Agua y Saneamiento Ambiental**
**-PAYSA-**

**Desarrollado por WASH/INCAP**

ENCUESTADOR _____

## 1.a. IDENTIFICACION DE LA COMUNIDAD

1 a 1 Nombre de la comunida _____

1 a 2. Nombre del municipio _____

1 a 3 Fecha de la visita _____

1 a 4 Nombre informante _____

1 a 5 Estatus del informante _____

1 a 6 Numero de comunidad _____

## 1 b CARACTERISTICAS DE LA COMUNIDAD

1 b 1 Tipo de comunidad
1 aldea
2. caserio
3 canton
4. finca
5. paraje
6. Otro _____

1 b 2 Configuracion dela comunidad
1. concentratada
2. dispersada
3. Concentrada y dispersada

1 b 3. Tipo de acceso a la comunidad (codifique el nivel mas alto)
1. Solo a pie/caballo
2 En moto solo en invierno
3. En moto todo tiempo
4 Auto de doble solo verano
5 Auto de doble todo tiempo
6 Auto corriente solo verano
7. Auto corriente todo tiempo
8 Transporte regular de pasajeros solo verano

1 b 4 Cuales son los medios de intercomunicación con que cuenta la comunidad (Mas alto)
0. Ninguno
1. Alguacil
2. Telegrafo
3. Radio transmisor
4. Telefono
5. Otro

I b 5 Que tipo de servicios de salud hay en la comunidad (Codifique nivel mas alto)

0. Ninguno
1. Visitas de tecnico de salud
2 Botiquin
3. Farmacia
4 Puesto de Salud
5. Centro de Salud
6. Consultoria medica privada

I b 6 Existen alginos programas de asistencia socil (SONDEE: CARE. Agua del Pueblo. Caritas. PLAN. etc)

0. No
1. Si

I b 6 b Si hay, cuales son? _____

I b 7 Hay cooperativas en la comunidad? (Sondee: Ahoro/credito. consumo. producción agricola. artesania etc )

0 No
1 Si

I b 7 b Si hay, cuales son? _____

I b 8. Cuantos molinos de nixtamal hay en la comunidad? _____

I b 9 Hay luz electrica en la comunidad?

0 No
1. Si

I b 10 Como se obtiene agua en la comunidad?

1. Rio, lago
2. Ojo de agua
3 Manantial, fuente cubierta
4. Tuberia poliducto
5. Pilas publicas
6 Chorros domiciliares

I b 11 Hay una escuela en la comunidad?

0. No
1. Si

I b 13 Hay mercado en la comunidad?

0. No
1. Si

I.b 13 b. Si hay mercado, que dia es? _____

1 b 14 Hay una feria?
0. No
1. Si

1 b 14 b Si hay feria, que fecha es?

1 c. INFORMACION SOBRE PRODUCCION Y MIGRACION

1 c 1 Cual es el cultivo principal en la comunidad?

1 c 2 Hay cultivos comerciales que se dan en gran escala por aqui?
0. No
1. Si

1 c 2 b Si hay, cuales son?

1 c 3 En que mes comienza la siembra principal de maiz?

1 c 4 Cuanto se paga por un jornal de trabajo en la comunidad?

1 c 5. La gente de esta comunidad salen temporalmente a fincas para trabajar?
0. No
1. Si

1 c 6 Si salen gente, en que meses mayoriamente? De:
Hasta:

1.d INFORMACION SOBRE IDIOMAS

1 d 1 Cual es el nivel de bilinguismo de la mayoria de los hombres de la comunidad?
1 Monolingue maya
2 Bilingue incipiente
3. Bilingue moderado
4 Bilingue substancial
5 Predominante castellano
6. Unicamente castellano

1 d 1. Cual es el nivel de bilinguismo de la mayoria de las mujeres de la comunidad?
1 Monolingue maya
2 Bilingue incipiente
3. Bilingue moderado
4 Bilingue substancial
5. Predominante castellano
6 Unicamente castellano

## Appendix 5

# DESCRIPTION OF KAP INDICES

A number of indices were created to represent particular aspects of interest to this study. The three main indices were (1) household socioeconomic status; (2) knowledge of diarrhea management; and (3) household hygiene. Each of these was created using sub-indices. We report below the principles used in the construction of the indices, and the actual content of each of them.

### Principles of Index Creation

Indices are useful to represent areas of interest otherwise difficult to quantify, such as socioeconomic status and/or behavioral data. A common form of deriving an index is to first identify clearly the general area of interest (say knowledge of diarrhea management), and then isolate sub-elements that are part and constituents of this general area of interest. In the case of knowledge of diarrhea management for instance, one could distinguish between three sub-elements, such as knowledge of preventive measures to avoid diarrhea, knowledge of curative techniques, and knowledge of the importance of environmental conditions in diarrhea control Then each of these sub-elements is further disaggregated and operationalized into a series of questions aiming at tapping as much information as possible from the respondent on his or her knowledge of this sub-element. For instance, we stated already that knowledge of diarrhea management can be operationalized through three sub-components. If we select one of these, say knowledge of curative techniques, it can be further divided between specific indicators such as knowledge of appropriate feeding practices; knowledge of type of medication available, and knowledge of the correct use of this medication. These indicators easily lend themselves to operationalization through questions specifically designed to assess the respondent's knowledge or understanding of each indicator. For instance, the indicator "knowledge of appropriate feeding practices" can be assessed by asking the respondent whether she thinks it is best to keep breastfeeding or feeding a child who has diarrhea or not. The response will be coded "0" (when for instance the mother says she stops feeding the child, which is an incorrect practice) and coded "1" (when the mother reports the correct practice, which is to keep giving food to the child). The codes thus obtained can then be interpreted as scores, and aggregated over a number of questions (through simple summation, or summation after weighing responses through a technique such as t-scoring). The aggregated scores obtained by the respondent over a range of questions (which all correspond to the "diarrhea treatment" sub-dimension) then constitutes this respondent's score on that sub-dimension. Once calculated, individual sub-dimensions can be correlated, factor analyzed, and/or compared using statistics like alpha coefficients to examine whether or not they participate to the same general dimension. Theoretically, one would expect all sub-dimensions defined under a general area of interest to show high correlation between each other, as the

person's knowledge over any sub-dimension rarely comes independently from that acquired over germane sub-dimensions. Thus every sub-element is constituted of two parts: that which over-laps with the other sub-dimensions (and can be most simply represented mathematically as Pearsons' r); and that which is not correlated with the others (1-r). This latter part represents the unique or specific contribution of this sub-dimension to the general dimension of interest.

These principles were applied in the construction of the various indices used in this study. Below we present the three main indices used and their particular components. All SAS statements used in creating these indices are found in the program KAPIX.PRG.

**General Dimension: Socioeconomic status** (SESIX)

Sub-Dimension 1: Quality of House Construction (CASAIX)

Indicators:

- Floor material (A19)
- Roof material (A20)
- Wall material (A21)

Sub-Dimension 2. Domestic Assets (GOODIX)

Indicators:

- Number of vehicles owned (A22)
- Number of large animals owned (A23)
- Number of household appliances owned (A24)
- Number of furniture items owned (A25)

Transformations: In both sub-dimensions, we first computed the score by adding the score on each indicator (resulting in CASAIX and GOODIX) and then reducing it to quintiles (CASAQ and GOODQ). The final index corresponds to the sum of the two sub-dimension quintile scores, divided by 2 to obtain a 1 to 5 range (SESQ = (CASAQ + GOODQ)/2). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in SESM.

**General Dimension: Knowledge of Diarrhea**

Sub-Dimension 1: Knowledge of Preventive Measures to Avoid Diarrhea (PREVIX)

Indicators:

- What are the causes of diarrhea (B01)
- What can be done to avoid diarrhea (B02-B03)

Transformations. PREVIX = SUM of B01 to B03

Sub-Dimension 2: Knowledge of Treatment for Diarrhea Episodes (TRATIX)

Indicators:

- Proper feeding practices(MAMCOMIX, from B06-B07)
- Knowledge of ORS therapy in packet (SOBSROIX)
- Knowledge of ORS home-made therapy (CASSROIX) (B08-B16)

Transformations: TRATIX = TRATIX = MAMCOMIX + SOBSROIX + CASSROIX. Then TRATIX was reduced to quintiles, resulting in TRATQ; and in dichotomous form by cutting at the median, resulting in TRATM.

**General Dimension: Environmental Awareness**

Sub-Dimension 1: Garbage Removal Techniques (BASURIX)

Indicators:

- How does respondent dispose of garbage (B18)
- What are other ways of disposing of garbage (B19)

Transformations The index was computed by adding the score on each indicator (resulting in BASURIX) and then reducing it to quintiles (BASURQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in BASURM.

Sub-Dimension 2: Knowledge of Environmental Issues (AMBIENIX)

Indicators.

- What can be done to protect the environment (B20)
- What is the effect of deforestation (B21)

Transformations: The index was computed by adding the score on each indicator (resulting in AMBIENIX) and then reducing it to quintiles (AMBIENQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in AMBIENM.

**General Dimension: Intervention of Health Agents (PROMOTIX)**

Sub-Dimension 1: Intervention of Health Agents (Only Sub-Dimension)

Indicators:

- Level of interaction between health agents and respondents (B22-B26)

Transformations: The index was computed by adding the score on the indicators (resulting in PROMOTIX) and then reducing it to quintiles (PROMOTQQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in PROMOTM.

**General Dimension: Personal and Household Hygiene**

Sub-Dimension 1: Mother's Hand Washing (LAVMANIX)

Indicators:

- Knowledge of when one has to wash hands (B04)
- Demonstration of hand washing technique (B05)

Transformations. The index was computed by adding the score on the indicators (resulting in LAVMANIX) and then reducing it to quintiles (LAVMANQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in LAVMANM.

Sub-Dimension 2: Dish Washing (LAVTRAIX)

Indicators.

- Demonstration of dish washing technique (B17)

Transformations: The index was computed by adding the score on the indicator (resulting in LAVRAIX) and then reducing it to quintiles (LAVTRAQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in LAVTRAM.

Sub-Dimension 3: Household Cleanliness (OBSCASIX)

Indicators:

- Observations of household conditions of cleanliness (C01-C11, C26)

Transformations The index was computed by adding the score on the indicators (resulting in OBSCASIX) and then reducing it to quintiles (OBSCASQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in OBCASM.

Sub-Dimension 4: Quality of Sanitation Facilities

Indicators.

- Presence of a latrine (HAYLET, from C13)
- Quality of latrine construction (OBSLETIX) (C12, C14-C22)

Transformations: The HAYLET variable was coded 0 when there was no latrine (C13=0) and 1 when there was a latrine (C13=1). The OBSLETIX index was computed by adding the score on the observations C12, C14 to C22 (resulting in OBSCASIX). It was then reduced to quintiles (OBSLETQ). The index was also transformed in a dichotomous variable using the median as cut-off point, resulting in OBSLETM.

Sub-Dimension 5: Quality of Water Access (OBSAGUIX)

Indicators:

- Type of water supply available (C23)
- If domestic tap, condition in which found (C24-C25)

Transformations The C23 variable was already ranked in order of quality of water access. The score obtained on this indicator thus constitutes the basic score for the index OBSAGUIX. If the home had a domestic tap, questions C24 and C25 were further asked, and one further point was granted to the index in case of positive response on each of these additional questions. It was not reduced to quintiles or median groups.

## Appendix 6

# SCHEDULE OF ACTIVITIES

Presentation of final report

| | Oct | | November | | | | December | | | | | January | | | | February | | | | March | | | | | April | | | | May | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Preliminary work | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Team Planning Meeting | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Selection of communities | | x | x | x | x | x | x | | | | | | | | | | | | | | | | | | | | | | | | |
| Preparation of instruments | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | | |
| Interviewing/Hiring of enumerators | | x | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | | | | | | | | | |
| Preliminary visits to communities | | | | | | | | x | x | x | x | | | | | | | | | | | | | | | | | | | | |
| Training of enumerators | | | | | | | | | | | | x | x | x | x | | | | | | | | | | | | | | | | |
| Fieldwork | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x | x | x | | | | | |
| Data entry | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | x | x | | | | |
| Data analysis | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | x | |
| Preliminary de-briefing | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | | | |
| Final de-briefing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | |
| Presentation of report | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x |

**Appendix 7**

# PERSONNEL INVOLVED

Except for the in-country chief of party and the project director, who were hired directly by WASH, all the personnel involved in carrying out the study were hired by INCAP. The following people were employed for the work INCAP had been contracted to do:

| Task | Person's Name | Time Employed |
|---|---|---|
| Help recruit enumerators | Helen de Ramirez | 1 week |
| Help train enumerators | Margarita Garcia | 1 week |
| | Blanca Sulecio | 2 weeks |
| Project secretary | Hazel de Orellana | 8 weeks |
| Field supervisors | Ana Maria Lopez | 14 weeks |
| | Eusebio Valerio Alvarez | 14 weeks |
| Driver | Julio de Leon | 10 weeks |
| Enumerators | Maria Helena Sucuqui | 14 weeks |
| | Maria Elena de Ordonez | 14 weeks |
| | Juana Julia Tepaz Raxuleu | 14 weeks |
| | Maria Matilde Sacalxot | 14 weeks |
| | Rosario Gomez | 10 weeks |
| | Maria Teresa Domingo Lopez | 14 weeks |
| | Reginalda Pablo Sales | 14 weeks |
| | Catarina Anzuelo | 6 weeks |
| | Marta Silvia Simon Peren | 5 weeks |
| | Himelda Ordonez Can | 5 weeks |
| | Marta Floridalma Gonzalez | 6 weeks |

In addition to these people, Dr. Juan Rivera and later Dr. Marie Ruel were responsible on behalf of INCAP for the project implementation, and Mr. Amilcar Belteton served as administrative assistant on the part of INCAP.

**Appendix 8**

# OTHER DOCUMENTATION NOT IN THIS REPORT

In addition to the documentation presented in this report, readers may request the following documentation from one of the persons or institutions stated below.

1. Electronic datasets (Lotus 1-2-3 format, or SAS format, or EpiInfo format)
2. Programs used to create the dataset (ISSA programs)
3 Programs used to validate and verify the datasets (EpiInfo and SAS programs)
4. Codebooks for electronic datasets
5. Programs used to create the transformed variables (SAS programs)
6. This report translated in Spanish
7 The enumerator manual (in Spanish)
8. The text of this report, of the questionnaire forms, and of the enumerator manual on electronic media

All of this documentation has been left at the addresses below. Requests for any of this will have to be evaluated by the USAID mission in Guatemala, which owns all the information related to this study.

USAID/Guatemala
c/o Pat O'Connor
AID, 9o piso
1a C , 7-66, Z-9
Guatemala

WASH,
c/o Ann Hirschey
1611 N. Kent St. Suite 1001
Arlington, VA 22209 USA

PAYSA
c/o Ing. Rene Guay
6av., 7-33, z-2,
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Steven A Esrey,
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Gilles Bergeron
INCAP,
Aptdo. Postal 1188,
Z.11, Guatemala City
GUATEMALA

**Camp Dresser & McKee International Inc.**
Associates in Rural Development, Inc.
International Science and Technology Institute
Research Triangle Institute
University Research Corporation
Training Resources Group
University of North Carolina at Chapel Hill

**WASH Operations Center**
1611 N. Kent St., Room 1001
Arlington, VA 22209-2111
Phone: (703) 243-8200
Fax: (703) 243-9004
Telex: WUI 64552
Cable Address: WASHAID

## THE WASH PROJECT

With the launching of the United Nations International Drinking Water Supply and Sanitation Decade in 1979, the United States Agency for International Development (A.I.D.) decided to augment and streamline its technical assistance capability in water and sanitation and, in 1980, funded the Water and Sanitation for Health Project (WASH). The funding mechanism was a multi-year, multi-million dollar contract, secured through competitive bidding. The first WASH contract was awarded to a consortium of organizations headed by Camp Dresser & McKee International Inc. (CDM), an international consulting firm specializing in environmental engineering services. Through two other bid proceedings since then, CDM has continued as the prime contractor.

Working under the close direction of A.I.D.'s Bureau for Science and Technology, Office of Health, the WASH Project provides technical assistance to A I.D missions or bureaus, other U.S. agencies (such as the Peace Corps), host governments, and non-governmental organizations to provide a wide range of technical assistance that includes the design, implementation, and evaluation of water and sanitation projects, to troubleshoot on-going projects, and to assist in disaster relief operations. WASH technical assistance is multi-disciplinary, drawing on experts in public health, training, financing, epidemiology, anthropology, management, engineering, community organization, environmental protection, and other subspecialties.

The WASH Information Center serves as a clearinghouse in water and sanitation, providing networking on guinea worm disease, rainwater harvesting, and peri-urban issues as well as technical information backstopping for most WASH assignments.

The WASH Project issues about thirty or forty reports a year. WASH *Field Reports* relate to specific assignments in specific countries; they articulate the findings of the consultancy The more widely applicable *Technical Reports* consist of guidelines or "how-to" manuals on topics such as pump selection, detailed training workshop designs, and state-of-the-art information on finance, community organization, and many other topics of vital interest to the water and sanitation sector. In addition, WASH occasionally publishes special reports to synthesize the lessons it has learned from its wide field experience.

For more information about the WASH Project or to request a WASH report, contact the WASH Operations Center at the above address.