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Environmental and Behavioral Risk Factors
for Diarrheal Diseases in Childhood:
A Survey in Two Towns in Morocco

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by
Patrick Kelly
Habib Khanfir
Patricia H. David
Michelle Arata
and Eckhard F. Kleinau

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ABOUT THE AUTHORS

Patrick G. Kelly, M.D., M.P.H., formerly a technical officer working in West African countries in the BASICS project, is an international health consultant/researcher telecommuting from Portland, Maine. Roles he has experienced during the last 30 years include Peace Corps physician, primary health care specialist, project evaluator, epidemiologist, trainer, and researcher. The major focus of his research experience has been maternal and child care, including health facility and community-based studies on maternal and child mortality, family planning, and the quality of care of the sick child.

Habib Khanfir holds a diploma in agricultural engineering and an M.S. in agro-socioeconomics. He is an expert in community participation and development. As a consultant for EHP since 1985, he has played a formative role in the CIMEP approach and in qualitative research techniques for EHP programs in Tunisia, Benin, the Ivory Coast, and Morocco. He is also a consultant in the same area for the World Bank, FIDA and CEE.II. For 10 years, he worked for Save the Children USA as a project manager and then as director of its Tunisian office. Before that, he spent 15 years in the Tunisian Ministry of Agriculture, where he was in charge of research, analysis and banking relations for the Ministry's Cooperative Sector office.

Patricia H. David, Ph.D., has served as Senior Evaluation Advisor for John Snow, Incorporated (JSI), since January 1999 and Visiting Lecturer, Dept. of Population and International Health, Harvard School of Public Health, since October 1995. Dr. David is a former lecturer, Centre for Population Studies, London School of Hygiene and Tropical Medicine. She has worked with a range of donors on health- and poverty-related monitoring issues and specializes in linking evaluation data to practical applications for program management and policy making.

Michelle S. Arata is a biostatistician who works at Tulane University in New Orleans, Louisiana.

Eckhard F. Kleinau, M.D., Dr.P.H., has 20 years of experience as a manager and consultant in public health and primary care programs in the United States, Europe, Africa, Latin and Central America, and Asia. Presently, he is Senior Technical Director at the Environmental Health Project (EHP) for JSI in Arlington, Virginia, and is responsible for the development and implementation of appropriate methods and standards to evaluate environmental health programs, including systems that provide information for strategic planning and management. In addition, he has specific expertise in economic analysis, health care financing, modeling and forecasting, quality assurance, and quality management.

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ACRONYMS

CIMEP	Community Involvement in the Management of Environmental Pollution
EHP	Environmental Health Project
JSI	John Snow, Incorporated
USAID	U.S. Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

In July and August 1999, a cross-sectional survey was conducted in 12 neighborhoods in the towns of Drarga and Ouled Teima in Morocco to assess the prevalence of childhood diarrhea and identify associated risk factors. The survey was designed to provide communities with general guidance about the magnitude of the problem and point out areas for potential interventions. Sample size was estimated to detect a difference in prevalence of 15% or greater. The survey obtained completed interviews with 401 families with children under age five (about 200 families in each).

Of the 401 children randomly chosen from sampled households, 42% were reported to have had diarrhea during the two weeks prior to the interview. Almost a quarter of those cases reported blood or mucus in the stools. There was no significant variation in diarrhea prevalence between the two towns.

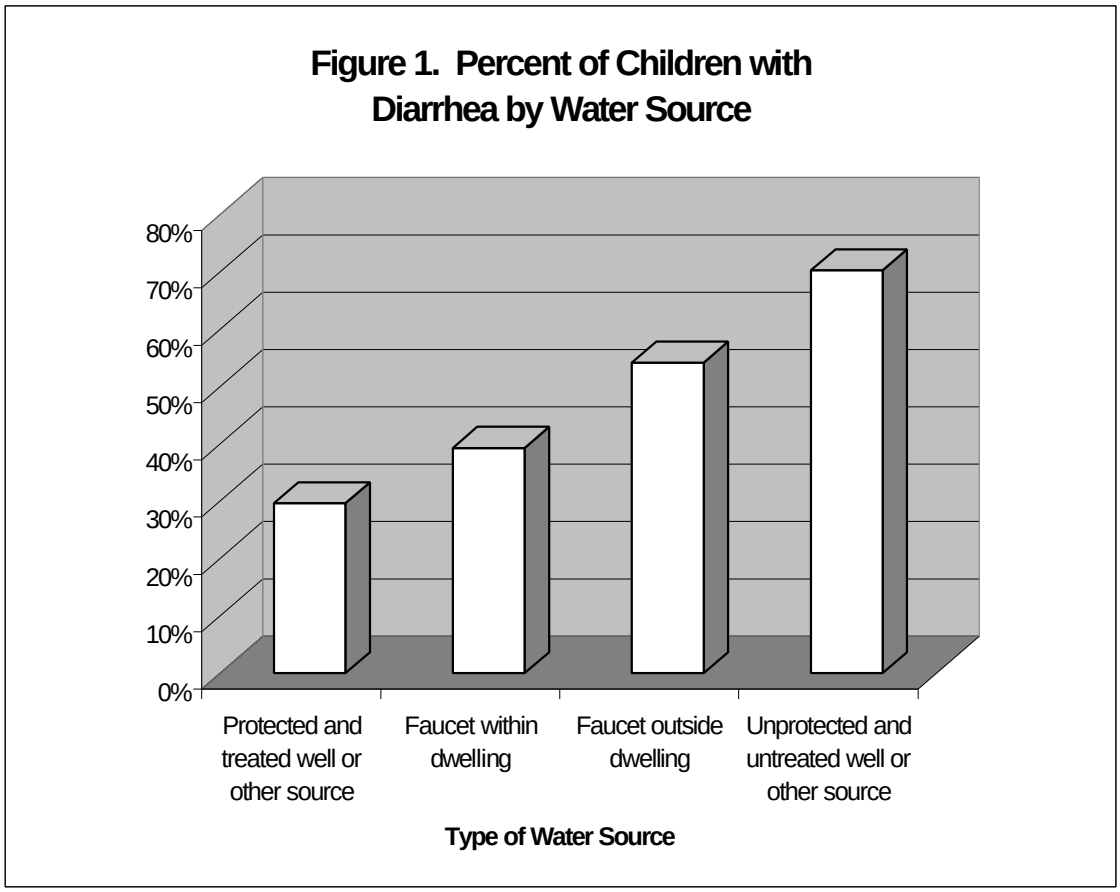
Water Source

Eighty-four percent of all households in the sample have access to piped water, and 78% of all households have a tap in their dwelling. Almost 10% of households use untreated, nontap sources of water. Nontap water sources are highly clustered, and it appears that diarrhea prevalence is similarly clustered. If unprotected, untreated water sources are used as a reference category, children in households with access to tap water are about 40% less likely to have diarrhea than children where only untreated, nontap sources are used. The risk is greater, however, for those households with access only to a tap outside their dwelling. In these households, 54% of the children had diarrhea in the two-week period prior to the survey compared with 39% of children with in-house taps. Children with access to protected and treated well water are almost 60% less likely to have a case of diarrhea. (See Figure 1.) Running water from a tap seems to be a safe source of water. However, while water quality was not measured as part of this survey, these findings suggest that tap water *quality* may need to be improved, especially when water is accessed outside the household, by improving municipal-level water treatment or purifying water at the household level by boiling or filtering to destroy pathogens. Water quality should be investigated further before a decision can be made about the most effective action.

Sanitation and Hygiene Behavior

Improper disposal of children's feces raised the likelihood of diarrhea among the index children in the survey by about 70%. This means that when a child's feces are not disposed of in a toilet (either excreted directly or deposited after excretion), the risk of diarrhea is between 1.3 and 2.1 times greater than when a mother reports that excreta are disposed of properly. Where these facilities did exist, one in six households did not use them to dispose of children's waste. Animal or human excreta was observed around or inside 30% of the dwellings, thereby indicating inappropriate hygiene behaviors in many households in these communities. The presence of human feces is highly correlated with not having a functioning latrine or toilet on the premises. Where inhabitants either use nature or a simple hole in the ground to relieve themselves, fecal matter was seen in 91% of the 22 households. The survey found human fecal matter in 26% of households with a turk (vast majority) or roman toilet. Although the number of households without a functioning latrine is small—

only 6% of households did not have access to toilets—the difference in fecal contamination is striking. It is clear that even in households with optimal facilities, hygienic practices could be improved.



Supplemental Feeding

Of those 201 children (of any age) receiving milk other than breast milk, 63% of those fed by bottle and only 37% of those fed by cup had diarrhea. This equates to a 70% increase in the likelihood of diarrhea occurring among bottle-fed children, thus indicating that dirty bottles or feeds made with contaminated water could be an important cause of diarrhea.

Education and Prevention Knowledge

Children of mothers with no formal education are 1.3 times more likely to have diarrhea than children of mothers with some education. Among mothers with some education, less than one-third of children had diarrhea in the high-prevalence season. For Morocco as a whole, the 1995 Demographic and Health Survey found that almost 60% of women had no education, as compared with this sample, where more than 80% have no education (*Studies in Family Planning*,1996). This sample seems to be drawn from a population that is highly skewed towards the lower end of the education range, resembling a rural population but

living in an urban environment with all the consequences that a crowded city environment can bring. This may be one reason for the high prevalence of diarrhea found in this survey, where most mothers and almost one-half of all household heads have no education, a factor that is usually strongly associated with diarrhea prevalence.

Responses to four of the survey questions reflecting knowledge of disease causation and prevention were associated on their own with significant differences in diarrhea prevalence among the index children. Children whose caretakers thought that washing children's hands, supervising what they eat, washing fruits and vegetables, and washing kitchen utensils are important preventive actions had a lower prevalence of diarrhea. All such practices were protective against diarrhea, reducing risk by about 40% when compared with children of mothers who thought that these practices were unimportant in diarrhea prevention.

Suggested Indicators

The probability of diarrhea in the sampled households was about 0.42 among children under five—one in every 2.3 children in the sample was a reported case. As a result of this study, one can calculate the impact that making changes in household environment and hygiene practices would have on the prevalence of diarrhea. For example, using the data from the final regression equation, for a child living in a household in a "worst case" scenario, the probability of contracting diarrhea increases to almost 1. (The "worst case" scenario is a household where the child is bottle fed with untreated water, and the mother does not dispose of the child's feces in a toilet, nor does she believe that handwashing and washing cooking utensils are important.) In such a scenario, every child (97 of every 100 children) would have diarrhea.

In a "best case" scenario where the child is not bottle fed, the family uses treated well water, and the mother disposes of the child's feces in the toilet and believes that handwashing and washing cooking utensils are important preventive actions, the prevalence of diarrhea might be reduced substantially during the high season. For these children, the risk decreases to 0.14, or one child in every seven having an episode.

It has been suggested that the high prevalence of diarrhea found during the summer months in these neighborhoods merely reflects eating too much fruit. If eating fruit was the only cause of reported cases of diarrhea, it is unlikely that this survey would have found such strong associations between diarrhea and risk factors related to parental knowledge, hygiene behavior, and household environment. Moreover, key findings of this study about the relationship between water, sanitation, and hygiene and diarrhea are similar to those reported from other research.

There are a number of important interventions that can be taken to reduce the risk of diarrhea in this population. These include treating and protecting existing wells, boiling or filtering other water sources if necessary, reducing bottle feeding, and improving household hygiene. Since almost all households have toilet facilities and sanitary waste facilities, proper disposal of children's feces is one action that can be taken immediately if parents are made aware of

its importance. Mothers need to understand the importance of the child's personal hygiene, especially handwashing. Since households have ready access to running water, increasing this practice also should be possible.

Survey findings suggest that a number of important indicators can be used to plan and monitor interventions to improve the chances that a child will remain healthy:

- Household-level access to tap water
- Quality of tap water inside and outside houses
- Effectiveness of water treatment (tap and well) at municipal and household levels
- Proper disposal of children's feces and use of toilet facilities by family members (as observed through the existence of human excreta on household premises)
- Supplemental feeding of children using means other than a bottle
- Knowledge that washing children's hands and keeping household utensils clean are ways to prevent diarrhea

The neighborhoods included in this study may benefit only from programs that aim at reducing risk factors of childhood diarrhea in specific areas where a relatively large proportion of caretakers showed inappropriate behavior. For example, over half of the caretakers did not consider washing fruit and kitchen utensils important for preventing diarrhea. Concerning access to clean water sources and sanitation and other important hygiene behaviors (such as handwashing or child feeding), these study results could be more relevant to other communities in the Souss Massa and Dráa regions where larger population segments are exposed to diarrheal disease risk factors. Additional or different risk factors than those that were prominent in the Drarga and Ouled Teima neighborhoods may play a role elsewhere in southern Morocco and should be known when establishing priorities for interventions.

1 Introduction

Diarrheal diseases still account for almost a quarter of the diseases found among children under the age of five (World Health Organization, 1999). It is therefore imperative to identify and promote cost-effective strategies that are appropriate for communities in preventing diarrhea.

This cross-sectional survey is the third phase in a USAID-sponsored study to understand and estimate the impact of improvements in environmental infrastructure and household hygiene on childhood diarrhea in selected communities in the Souss Massa region in southern Morocco. During an initial preparatory phase, the Environmental Health Project (EHP) team developed a work plan, created partnerships with stakeholders, selected intervention sites, and gathered qualitative data to inform subsequent work. The second phase, conducted in April 1999, gathered information on risk factors for diarrheal disease through visits to households, hospitals, and clinics in two towns in Morocco, and evaluated the feasibility of a larger household survey. This study found good cooperation among a small sample of households and was able to obtain information on household water sources and storage, waste disposal, and domestic and personal hygiene. This small-scale survey did not attempt to quantify morbidity prevalence or patterns, but provided detailed information for the construction of a questionnaire for the larger quantitative survey to be conducted during the summer, the high-prevalence season for childhood diarrhea. The results of study phases one and two are reported elsewhere (Yacoob, M., *et al*, 1999).

The main objectives of the third phase, as reported here, are to identify the prevalence and pattern of childhood diarrhea and primary risk factors associated with diarrhea cases, and to recommend indicators useful for monitoring programmatic improvements. Another associated aim of the study is to engage local stakeholders in the discussion about various interventions to reduce these risk factors. This was accomplished by involving community members in the survey process and by discussing with all stakeholders the implications of survey findings.

The survey was conducted in 12 neighborhoods in the towns of Drarga and Ouled Teima (six neighborhoods in each) in late July and August 1999, when diarrhea has a high incidence. These towns are representative of small and medium-size market towns in Morocco, where 47% of the population resides. The towns include a mix of available services and urban infrastructure and represent a transitional residential mode between the traditional rural and major urban center. With increasing urbanization in Morocco, these towns exemplify the current challenges to provide administrative and municipal services for a healthy urban infrastructure (Yacoob, *et al*,1999).

2 Background

Childhood illness and death result from a complex array of biological and behavioral factors. Diarrheal disease can be linked to a set of *proximate determinants* of child survival as presented by Mosley and Chen (1984) in their useful and influential model, which describes the numerous pathways that may lead to childhood illness and subsequent death. (See Figure 2.)

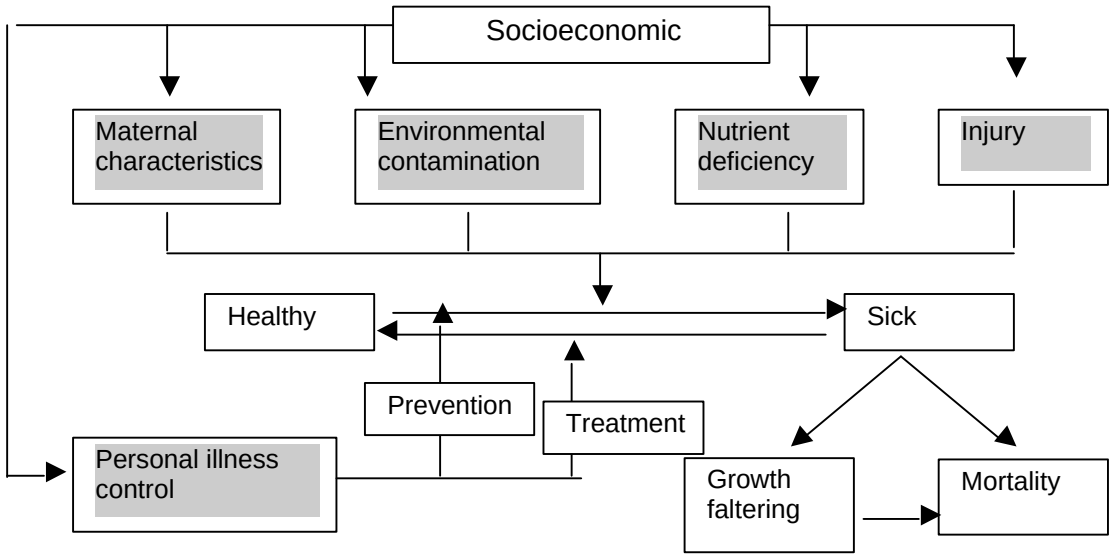


Figure 2. Five Groups of Proximate Determinants of Child Health Dynamics. (From Mosley and Chen, 1984, p. 29).

This model provided a framework for the present study, enabling reviewers to categorize the potential risk factors for childhood diarrhea. The key element of the framework is the understanding that positive and negative features of the household environment may influence the occurrence of disease directly, but more often are modified by other factors. These other factors—the proximate determinants in the model—are such things as parental knowledge, preventive health behaviors, and the constitution of the child—how susceptible he or she is to pathogens in the environment (depending on previous illness, age, and nutritional status). These factors can work to improve health, despite a risky environment, or to increase ill health, even in an environment that should be safe.

For example, a fully breastfed infant is protected from exposure to disease-causing pathogens and may not have an episode of diarrhea in his or her first six months, even though the family dwelling has no running water or sewage connections. As supplemental food and drinks are introduced, if the mother knows and practices good hygiene, is able to prevent contamination

of her child's food, and keeps the dwelling and its surroundings free of wastewater and excreta, the child may still remain healthy. On the other hand, a family may have access to large quantities of safe water, yet the parents may not know its importance to child health, nor use it to maintain a contamination-free environment for the child.

This study focuses on the impact of water and sanitation infrastructure and parental knowledge and hygiene behavior on diarrhea prevalence. A specific hypothesis the study was designed to test is that the impact of improved infrastructure will not reach its greatest potential unless appropriate hygiene behavior – a proximate determinant of disease – is practiced in the household.

The key risk factors for childhood diarrhea, and the interventions shown to be effective in reducing risk, were reviewed in depth by Feachem and his colleagues 15 years ago (Feachem, *et al*, 1983; Feachem and Koblinsky 1984a; Feachem, RG 1984b; Ashworth and Feachem, 1985). The literature has recently been reevaluated, the knowledge that water supply and sanitation improvements are effective in preventing diarrheal disease has been confirmed, and the importance of breastfeeding practices firmly established (Huttly, *et al*,1997).

New insights are still causing debate, however. Esrey's recent (1991) review of intervention studies worldwide suggests that improvements in excreta disposal and water quantity, rather than water quality alone, are likely to have the greatest benefits. His multicountry study using data from eight demographic and health surveys demonstrates that sanitation improvements have a greater impact on the prevalence of diarrhea than improvements in water supply (Esrey, 1996).

Water supply and sanitation interventions have varied widely in the impacts they have achieved (Huttly, *et al*,1997). Some have argued that these interventions are more cost-effective than they appear because they provide direct and indirect benefits to health and, by reducing diarrhea incidence, may also reduce the severity of other illnesses (Mosley and Becker, 1991).

Several studies have produced conflicting evidence. Esrey and Habicht (1988) in the Philippines found that proper sanitary facilities had a greater effect on childhood diarrhea prevalence if the mother was not educated (a proxy for maternal health knowledge) than if she was. Another study in Lesotho, however, demonstrated that the presence of safe excreta disposal facilities had a significant impact on diarrheal morbidity, and this effect increased among households that used more water, practiced better personal hygiene, and had better educated mothers (Daniels, *et al*, 1990).

This survey also gathered data on household characteristics, including parental education and sources of environmental contamination that expose children to infectious agents. Few parents in the study sites were well educated, and most mothers had no education at all. Thus, the question of whether sanitary interventions in Morocco may provide even greater benefits to children in households where parents are most likely to lack knowledge of disease causation is important.

Since Feachem's first reviews, much attention has focused on evaluating interventions to improve hygiene practices in households. The results of these studies indicate that hygiene education programs that target a single behavior such as handwashing are likely to produce the largest impact on health status (Huttly, *et al*, 1997). The primary water-related hygiene behaviors now promoted by WHO are the following:

- Cleaning hands, especially after defecation and cleaning babies' bottoms, before eating, and before preparing food
- Properly disposing of feces, including those of young children
- Maintaining drinking water free from fecal contamination

In the study sites, it was important to quantify the influence of the direct provision of improved services on diarrheal morbidity and to examine how parental behavior may enhance or reduce these effects. For this reason, reviewers obtained detailed information on maternal knowledge and hygiene behaviors, which enabled them to look at the relationship between the two.

It was also important to pinpoint one or two hygiene behaviors needing improvement, where benefits can most likely be reaped quickly if behaviors are changed. For example, researchers elsewhere have noted that mothers who must go long distances to obtain water or must buy it from vendors will find ways to conserve or reuse it. And, while most people want to avoid "dirtiness" and will wash their hands, knowledge of how disease is caused and can be prevented may determine when and how they wash (AHRTAG, 1989).

In addition to observing the method of handwashing, the survey gathered information about which occasions mothers of young children perceived would require handwashing and whether the household had a separate area for handwashing. While mothers will wash their hands if they become contaminated by garbage or adult human feces, which they may consider vehicles for transmission of illness, these same mothers may not consider a baby's stools dangerous and will take less care handling them. It is obvious that in addition to knowing *how* to wash hands effectively, one must know *when* it is important to wash. Such decisions need to be based on accurate knowledge, which may not coincide with a mother's perception of dirtiness.

Interventions often aim to increase knowledge about disease prevention, but knowledge does not always determine practice. Behavior is influenced by what one's neighbors do, as well as by information. Behavior, whether supported by accurate information or not, is likely to be an important determinant of illness patterns.

One of the more difficult behaviors to study is food hygiene practices, and as a result, the impact of promoting improved food hygiene on diarrheal disease remains unknown (Ashworth, 1998). In this survey, data were collected to allow reviewers to examine the association between diarrhea and reported practices of water storage, prevention of food contamination, and handwashing and diarrhea prevalence. The study also allowed a

comparison of some measures of knowledge with reports and observations of hygiene behavior.

As already noted, other factors can obviously affect the impact of water and sanitation interventions. It is now well established that children who are not breastfed are at greater risk of diarrheal disease. Victora's major study in Brazil found that infants only partially breastfed had more than four times greater risk of dying of diarrhea-related causes, and for those who received no breast milk, this risk increased to 14 times compared with fully breastfed infants (Victora, 1989). It was proven more than 15 years ago that preparing bottles with unsafe water is closely related to diarrhea and consequent malnutrition (David and David, 1984; David, *et al*, 1983). As a result, the impact of improved water supply and sanitary facilities on diarrheal morbidity is greater among infants who are not breastfed (VanDerslice, *et al*, 1994, cited in Huttly, *et al*, 1997). To assess the independent effect of improved services when differences in feeding practices exist, the survey collected information on the feeding practices of various households.

In addition to the child's dietary intake, factors such as past illness history and malnutrition may also lead, through a weakened immune system, to prolonged episodes of diarrheal disease (Bairagi, *et al*, 1987; Baqui, *et al*, 1992). These etiologic factors, however, are not the subject of this study.

Several studies have now demonstrated the rather poor correspondence between reports of hygienic practices and actual observation of practices related to diarrhea prevention (Curtis, *et al*, 1993; Manun'Ebo, *et al*, 1997). Thus, this study used a structured instrument to gather additional data based on observations of household cleanliness and evidence of proper waste disposal. Some of the observational data were compared with reports of parental knowledge and behaviors.

3 Survey Methodology

The cross-sectional survey in phase three was designed as the baseline survey to provide data for monitoring the impact and effectiveness of a water supply and sanitation intervention project. This survey was designed to assess the prevalence of childhood diarrhea and identify associated risk factors in two towns in Morocco—Drarga and Ouled Teima. A follow-up survey may be conducted to assess changes in diarrhea prevalence and evaluate the indicators recommended to monitor the impact of the interventions over time.

3.1 Questionnaire Structure

The prevalence survey instrument was designed based on the results of preceding phases of the study in the chosen communities and the conceptual framework of known predictors of childhood diarrhea.

The questionnaire includes an initial section designed to obtain basic information on the composition of the household visited. If no child under age five resided in the household, the interview ended. If the household had a child under five, further information was obtained on the head of household and the women who care for the young children (including marital status, education, and relationships). A listing of all children under five was then made, and the following information was obtained on one child, randomly selected from this list, and his or her household:

- Birth date, sex, presence and type of diarrhea (during preceding two-week period)
- Nutrition – source of milk and water
- Caretaker's beliefs concerning hygiene and causes of diarrhea
- Caretaker's hygiene behaviour
- Household environment – source and storage of water, type of sanitary facility and connections
- Observation of domestic hygiene
- Food preparation facilities

The questionnaire was developed in French and pretested and translated into Arabic and Berber.

3.2 Sample Selection

The survey obtained completed interviews with 401 families with children under age five (about 200 families in each site). The sample was designed to provide an estimate of

expected reduction in diarrhea prevalence from a preintervention level of 35% (assumed to be the preintervention high-season prevalence) to 20%, at the 95% confidence level and with 80% power to detect the estimated change. This means that the sample is large enough to detect a reduction in diarrhea prevalence of 15 percentage points 80 out of 100 times when the "true" change falls within the theorized confidence limits. The total sample size (n=400) is also sufficient to estimate the preintervention prevalence of diarrhea within ±5 percentage points of its "true" value. That is, if the "true" prevalence is 35%, then the sample is large enough to provide an estimate (for both towns combined) that lies between 30 and 40% in 95 out of 100 samples taken from the same population.

The neighborhoods chosen for the study sites comprise about 60% of the total households in Drarga and about 18% of those in Ouled Teima. Thus, all results presented refer only to these neighborhood populations and not to the entire population of the towns. The sample was drawn from a complete listing of households in the target neighborhoods of both towns: 1,309 households in six neighborhoods of Drarga and 2,485 households in six neighborhoods of Ouled Teima. Members from each municipality actively participated and conducted the census to prepare the complete household listing for the neighborhoods. These neighborhoods were identified in earlier phases of the study as providing sufficient variance in the characteristics of interest—household environmental factors. The neighborhoods were found to contain households with no running water or sanitary connections, with only running water, and with both running water and sewer service connections.

To obtain the desired sample of at least 200 households with a child under five for each town, interviewers visited a total of 800 households. Interviewers revisited households that were empty or where no adult was available for interview up to three times before dropping that household from the sample. In order to make separate estimates with the same precision, equal numbers of households were sampled in each town. The two towns vary considerably in size, but the sample of households in each is the same. Thus, overall estimates, aggregating data from both towns, must be weighted to allow for these differences.[1] All children under age five residing in sample households were listed, and their exact age and diarrhea status in the two weeks prior to the survey were obtained. When there was more than one child under age five in the household, one child was chosen randomly from the list to be the subject of the subsequent interview (see Appendix A: Survey Questionnaire).

3.3 Data Collection

Data were collected by field teams that included 10 Moroccan interviewers, three supervisors (including the two study coordinators), and three drivers and local guides. Fieldwork lasted for 10 days in July and August 1999, when diarrhea was assumed to be at a seasonal high.

[1] Weights were calculated based on the total number of sample households in each town as a proportion of the total number of households sampled (sample proportion), and on the total number of households in each town as a proportion of the total number of households (population proportion). Thus, weights will take account of the oversampling of households in Drarga needed to achieve the desired quota of households with a child under age five.

(See schedule of study activities, Appendix B.) Interviewers spoke Arabic, Berber, and French and chose the questionnaire of the language most appropriate for the household.

3.4 Analysis

The data were entered into a data file using the EPI-INFO6 program, and then they were exported for analysis using the SPSS statistical package. The files were weighted proportional to population size using the number of households as an approximation to produce estimates for the sample as a whole. The following tables included in this study provide weighted estimates, except when estimates are reported for Drarga and Ouled Teima separately. Since this is a cross-sectional survey, prevalence data are reported as are some prevalence ratios such as comparing proportions with diarrhea of mothers with and without education.

Because only a sample rather than all households in these neighborhoods were interviewed, the estimates reported are not exact measurements. Choosing a different sample of households might produce different results. Such differences are called *sampling errors*.

As a result, the differences observed must be tested to determine whether they are merely a result of this sampling error or real differences. It is possible to calculate a range, a *margin of error*, in which the actual difference can reasonably be expected to fall, given the size of the sample. The STATCALC feature of EPI-INFO6 was used to calculate these margins of error or *confidence limits* around the *prevalence ratios* (the ratio of one proportion to a second proportion), and hence determine the statistical significance of the differences.

For example, the proportion of children in Drarga with diarrhea (42.8%) can be compared with the proportion in Ouled Teima (42.4%). The ratio, Drarga % with diarrhea: Ouled Teima % with diarrhea, is 1.01. The confidence limits around this ratio are 0.80 and 1.26. When the margin of error (confidence limits) around a ratio includes 1, it means that due to *sampling error* the real ratio can fall anywhere between these two limits, and therefore is not significantly different from1.

Reviewers adopted the usual practice of assessing this margin of error with 95% confidence when reporting differences to be *statistically significant*. A statistically significant difference in the following text indicates that in 95 surveys of every 100 conducted in the same population, reviewers obtained an estimate that falls within the confidence limits calculated. There is only a 5% chance that the actual value in this population is outside that margin of error. For the example above, reviewers can be reasonably certain (95%) that the real ratio could fall anywhere within these limits and that therefore the very small observed difference between these two proportions is not likely to be a real difference.

Study findings are based on 12 selected neighborhoods, which are not representative of the overall risk of diarrheal disease in each town in Ouled Teima and Drarga. However, for simplicity, findings will be reported throughout the remainder of this document by town,

with the understanding that they are representative of the neighborhoods and not the two towns overall.

4 Characteristics of Study Households and Respondents

This chapter describes the respondents and their households based on the data collected in the survey.

4.1 Demographic and Social Characteristics

Table 1 displays selected demographic and social characteristics of the study respondents. Only 4% of households were headed by a woman, and 96% of household heads were married. Data revealed that 63% of household heads and 83% of primary caretakers (usually the mother) had received no formal schooling. More than 75% of families owned the dwelling in which they lived, and this varied only slightly between the two towns. The town of Drarga is predominantly populated by the Berber ethnic group (73%) and Ouled Teima by Arabs (79%). However, many Berbers in both towns use Arabic as their predominant language (45% of Drarga's population and 85% in Ouled Teima speak Arabic). Thus, there appears to be very little variation in the social composition of households in the two sites.

Interviewers questioned caretakers (96% of whom were the child's mother) about their child, their health knowledge, and their hygiene practices. In addition, they obtained more detail about the household's water source and waste disposal. The children's ages were well distributed across a range of 0 to 5 years. Because of the lack of specific birth dates, the ages of many of the children were rounded off at two, two and a half, three, and four years. (See Figure 3.)

Figure 3. Reported Ages of Children in the Sample

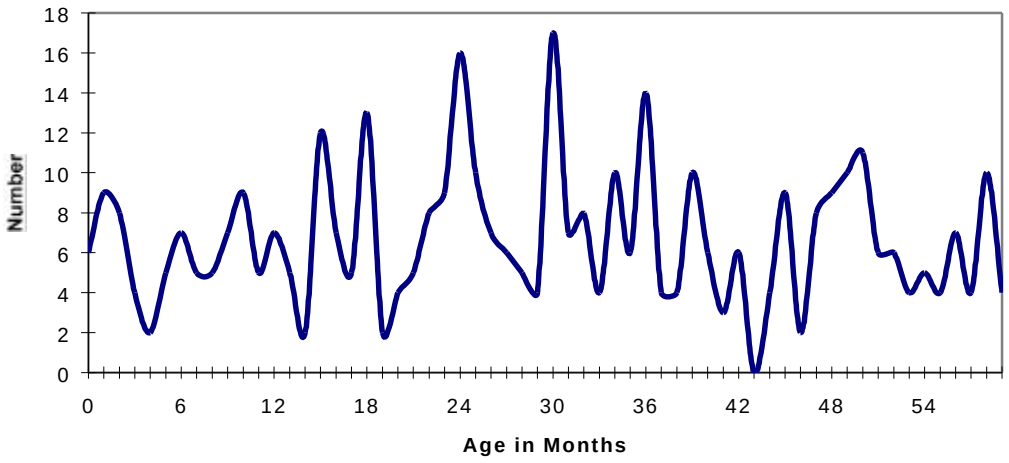


Table 1. **Demographic and Social Characteristics of Respondents**

	n	Weighted %
Household		
Ethnicity		
Arab	245	61.0%
Berber	156	39.0%
Language		
Arab	286	71.3%
Berber	114	28.4%
Both	1	0.2%
Owner of House		
Yes	304	75.8%
No	97	24.2%
Residence		
Drarga	138	34.5%
Ouled Teima	263	65.5%
Sex of Head of Household		
Male	385	96.0%
Female	17	4.2%
Education of Head of Household		
Primary	84	20.9%
More than primary	37	8.2%
None	254	63.3%
Education of Head of Household (cont.)		
Other	27	6.7%
Don't know	4	1.0%
Martial Status, Head of Household		
Single	4	1.0%
Married	385	96.0%
Divorced	8	2.0%
Widowed	5	1.2%
Unknown	1	0.2%
Respondent's Relation to the Child		
Mother	385	96.0%
Grandmother	5	1.2%
Sister-in-law	1	0.2%
Sister	6	1.5%
Aunt	2	0.5%
Other	3	0.7%
Education		
Yes	67	16.7%
No	334	83.3%
Index Children Less Than 5 Years		
Male	191	47.6%
Female	210	52.4%

4.2 Household Environment

Table 2 displays the household characteristics of interest in this survey. Of the total sample, 78% reported having water supplied through a tap in their dwelling: 92% of Drarga households and 71% of Ouled Teima households. In Ouled Teima, slightly fewer households (73%) reported a faucet in the dwelling as their water source, with almost 20% of the population relying on a well. Few households boil or otherwise treat the water they use at home (only 5% of the total).

Most of the remaining households in both towns get their water from either an outdoor tap (5% in Drarga and 7% in Ouled Teima) or from a protected communal well (3% and 14%, respectively). A few households in Ouled Teima have a private protected well, and a very few households in that town get their water from a truck. For more than 90% of households in both towns, this water supply is available throughout the year, although a small number in both towns reported inoperative sources during repairs or in the summer.

Regarding a question about whether nontap water was treated to reduce contaminants, of those 56 households that get water from a well or other source, less than half reported that the water was treated, usually with bleach.

4.3 Waste Disposal

Most households have rubbish collection service (89% overall), the majority of which is collected more than once per week. More than nine of every 10 households in this sample have access to a toilet in the home; only about 6% have no toilet facility available.

Most households dispose of children's feces in a toilet, but about 10% reported disposal in "trash" and another 10% dispose of feces outside the house or by burying it. Again, virtually no variation was found between the two towns in this respect.

Wastewater, or gray water, disposal varies considerably between the two towns. Overall, 50% of households are connected to a sewer, but in Drarga, 70% are connected, while in Ouled Teima, only 40% reported a connection. Households that have a septic tank vary from 17% in Drarga to 43% in Ouled Teima for a total of 34%. Only 14% use pits for disposal (*puit perdu)*, or dispose of the wastewater in the street or their own courtyard, and the remaining 2% is unknown.

Table 2. Household Environment

	n	Weighted %
Household		
Drinking Water Treatment at Home		
Yes (boiled, filtered, or bleached)	22	5.5%
No	242	90.6%
Don't know	3	1.1%
Water Source for Household		
Tap in house	312	77.8%
Tap outside house	24	6.0%
Community well, protected	42	10.5%
Community well, not protected	4	1.0%
Private well, protected	9	2.2%
Private well, not protected	1	0.2%
Trucked water	5	1.2%
Other	2	0.5%
Year-Round Availability of Water from Source		
Yes	370	92.3%
No	31	7.7%
Treatment of Nontap Water		
Yes	28	44.4%
No	28	44.4%
Don't know	6	9.5%

	n	Weighted %
Sanitation		
Type of Toilet		
Turk	362	90.3%
Roman	4	1.0%
Both Turk & Roman	10	2.5%
Hole Only	10	2.5%
In nature	15	3.7%
Other	1	0.2%
Rubbish Collection Service		
Yes	367	89.0%
No	42	10.5%
Frequency of Collection		
Every day	210	52.4%
< 3 days	125	31.2%
< 1 week	14	3.5%
> 1 week	5	1.2%
Don't know	1	0.2%
Unknown	2	0.5%
Reported Wastewater Disposal		
Sewer	202	50.4%
Puit perdu	26	6.5%
Septic tank	136	33.9%
In the street	32	8.0%

	n	Weighted %

Reported Wastewater Disposal (cont.)		
Other	5	1.2%
Unknown	1	0.2%
Observation of the House		
Rubbish Observed on:		
Interior floor		
Yes	90	22.4%
No	312	77.8%
Exterior floor		
Yes	172	42.9%
No	229	57.1%
Fecal Matter Observed Inside the Dwelling		
Human		
Yes	22	5.5%
No	379	94.5%
Animal		
Yes	30	7.5%
No	372	92.8%
Fecal Matter Observed Outside the Dwelling		
Human		
Yes	30	7.5%
No	361	90.0%
Animal		
Yes	86	21.4%

	n	Weighted %
Presence of Flies in Kitchen		
No flies	119	29.7%
A few flies	194	48.4%
Many flies	87	21.7%
Food Not Covered		
Yes	48	12.0%
No	351	87.5%
Don't know		
Unknown		
Working Refrigerator		
Yes	134	33.4%
No	264	65.8%
Don't know		
Unknown	2	0.5%
Energy Source		
Wood/coal	4	1.0%
Butane gas	272	67.8%
Wood/coal & Butane	114	28.4%
Electricity	12	3.0%
Other	0	0.0%
Somewhere to Wash Hands?		
Yes, with soap	150	37.3%
Yes, no soap	159	39.5%
No	93	23.2%

Ideally, all households that have piped water should also be connected to a sewage system to ensure appropriate disposal of wastewater and sewage. As Table 3 shows, about 17% more households in the Drarga neighborhoods had both services as compared with Ouled Teima. In the latter, more households had neither tap water nor sewer connection. One in seven households in Ouled Teima had a sewage connection only, consisting most likely of a septic pit.

Table 3. Combined Services in the Towns and Overall (% of households)

Combined Services:	Drarga	Ouled Teima	Total n	Weighted Total %
Both tap water and sewer connection	84.5%	67.2	294	73.3%
Tap water only	11.0%	10.4	43	10.7%
Neither tap nor sewer	2.5%	6.5	20	5.0%
Sewage connection only	1.5%	15.9	44	11.0%
Unknown	0.5%		1	0.2%

5 Morbidity Patterns

5.1 Levels

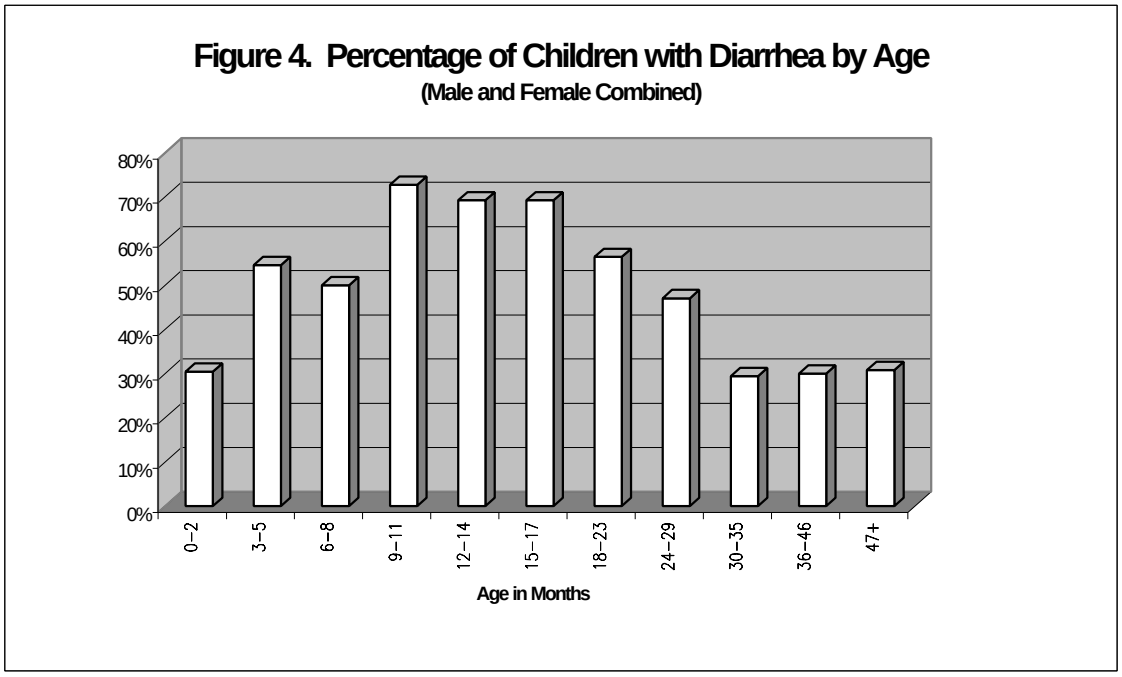
The definition of diarrhea as used in this survey is based on the mother's reported perception of the presence or absence of diarrhea—defined as three or more loose or watery stools per day. A mother's report of presence of blood or mucus in the stool was also recorded. This definition is used by WHO, the Demographic and Health Surveys, and UNICEF (WHO, 1997; Macro International, 1997; UNICEF, 1995). Of the 401 children randomly chosen from sampled households, 42% were reported to have had diarrhea during the two weeks prior to the interview. Almost a quarter of those cases reported blood or mucus in the stools. There was almost no variation in diarrhea prevalence between the two towns.

5.2 Age Patterns

The diarrhea cases reported in this study were distributed by age, as shown in Figure 4, and follow expected patterns. The critical period for childhood diarrhea, known as "weanling diarrhea," is between six and 18 months, and this has been widely recognized for many years (see the early work of Gordon, Chitkara, and Wyon, 1963). The highest number of diarrhea cases for children in these Moroccan neighborhoods fell into that period, occurring between nine and 18 months of age. The number of children in each age group was quite small, so only the overall pattern is of interest. The steady rise that occurred, beginning with a low of 35% at the youngest ages and peaking between the ages of nine months and one year, might suggest a relationship to feeding practices, as this is likely to be when almost all children are introduced to solid and semi-solid foods. By the age of 12 months, more than 75% of children are reportedly receiving milk other than breast milk, and by this age should be receiving other foods as well. Children are also beginning to have some independent mobility by age one and are more likely to be cared for at least part of the time by older siblings rather than the mother.

5.3 Sex of Child

Boys were more likely than girls to have a reported case of diarrhea, but the pattern of occurrence was similar and the difference could have occurred by chance. The ratio of the prevalence among boys to the prevalence among girls is 1.16. (The confidence limits are $0.92 < 1.16 < 1.46$.) In the two weeks preceding the survey, 46% of all boys and 40% of all girls had diarrhea.



5.4 Age and Education of Mother Related to Reported Diarrhea

The study also examined the pattern of reported diarrhea by the age and education of the children's caretakers. (Since 96% of caretakers were the children's mothers, the terms "caretaker" and "mother" are used interchangeably throughout this document.) This was important to examine since the younger and more educated women are more likely to have better knowledge and, perhaps, better hygiene in their households than older and less educated women.

As seen in Table 4, few mothers have any education at all. There is no clear pattern of diarrhea prevalence by age of caretaker, but children of uneducated mothers are 1.3 times more likely to have diarrhea than children of mothers with some education. This difference is consistent with findings by other researchers; however, it could have occurred by chance since the numbers of educated women are so small (prevalence ratio could range between $0.92 < 1.34 < 1.94$).

Among mothers with some education, less than one-third of children had diarrhea in the high-prevalence season; however, this is only a small proportion of the mothers interviewed (17%). For Morocco as a whole, the 1995 Demographic and Health Survey found that almost 60% of women had no education, as compared with the sample, where more than 80% have no education (*Studies in Family Planning*,1996).

Education of the household head was also associated with diarrhea prevalence, with 44% of children in households headed by an uneducated person reported to have diarrhea. This decreased to 42% in households where the head had at least a primary school education and

27% when the household head had attended grades higher than primary school. Less than 10% of household heads, however, fall into the latter category. This finding may also suggest a relationship between household wealth and childhood diarrhea, since education of the household head is often a good proximate indicator of economic status. The relationship between education and household water and sanitation services is explored in a later section.

This sample seems to be drawn from a population that is highly skewed towards the lower end of the education range, resembling a rural population but living in an urban environment with all the consequences that a crowded city environment can bring. This may be one reason for the high prevalence of diarrhea found in this survey, where most mothers and almost one-half of all household heads have no education, a factor that is usually strongly associated with diarrhea prevalence.

Table 4. Percentage of Children with Diarrhea by Age and Education of Mother

	No Education		Some Education		Total	
Age of Caretaker	**% of Children with Diarrhea**	**n**	**% of Children with Diarrhea**	**n**	**% of Children with Diarrhea**	**n**
15-19	41.2	17	16.7	6	34.8	23
20-24	52.5	59	37.0	27	47.7	86
25-29	39.4	99	38.1	21	39.2	120
30-34	49.4	83	20.0	5	47.7	88
35-39	38.3	47	0.0	3	36.0	50
40+	33.3	21	50.0	2	34.8	23
Unknown	50.0	10	100.0	1	54.5	11
Total	43.9	326	32.8	64	42.1	390

6 Risk Factors for Childhood Diarrhea (Bivariate Relationships)

This chapter examines the relationship between each hypothesized risk factor and the prevalence of diarrhea.

6.1 Nutrition and Feeding Practices Among Infants

Feeding practices, as noted earlier, are a likely factor in causing diarrhea. For children who are bottle fed, contaminated feeding can be caused by the use of contaminated water or unclean bottles, which are a likely source of pathogens (David and David, 1984). For those children under six months of age (the age when most mothers begin supplementing breast milk with solids or semi-solid food), only 35% of children reported to receive only breast milk had diarrhea, while 60% of those receiving other milk had diarrhea. Although breastfeeding has been shown to have a strong protective effect against diarrhea in other studies, the relationship is not statistically significant here because there were few children of this age in the sample. For children over six months, it has been proven that breast milk alone is not sufficient, and these children should be receiving other foods to supplement the breast milk.

Of those 201 children (of any age) receiving milk other than breast milk, 63% of those fed by bottle and only 37% of those fed by cup had diarrhea (Table 5). This equates to a 70% increase in the likelihood of diarrhea occurring among bottle-fed children. This difference could not have occurred by chance (confidence limits around the prevalence ratio = 1.28 <1.71<2.29), thus indicating that dirty bottles or feeds made with contaminated water could be an important cause of diarrhea.

Table 5. Percentage of Children with Diarrhea by Type of Feeding Container Used

Container	% with Diarrhea (n)	Prevalence Ratio (Margin of Error)	Total n
Bottle (and in combination)	63.2% (37)	1.71(1.28 – 2.29)*	59
Cup	36.6% (52)	1.00	142

* Indicates statistically significant prevalence ratios at the .05 level.
Note: Children receiving milk other than breast milk = 201

6.2 Parental Knowledge

This study established a relationship, although weak because of the small sample involved, between parental education and diarrhea prevalence among children under five. However, there is little to distinguish these respondents from one another when questioned about their knowledge of disease causation. Most respondents (80% to 90%) agreed that the principal causes of diarrhea are contaminated food, drinking water, or teething. A large percentage (70%) believed that "bad spirits" were an important cause of childhood diarrhea, while only 40% thought that malnutrition was an important cause.

More striking is the finding that almost one-fourth of respondents said that "dirty things in the mouth" were unimportant among the causes of diarrhea, and about 20% of the respondents also thought that a child's dirty hands and flies were insignificant in contracting diarrhea.

Most respondents reported that diarrhea is preventable (84%), and about nine of every 10 respondents said that keeping a clean house, washing fruits and vegetables, washing hands before cooking, washing kitchen utensils, supervising what children eat, and breastfeeding were important ways to do so. Nearly all respondents (98%) said that washing hands after changing a baby's diaper was important, but only 48% thought that boiling drinking water was important.

Responses to four of the questions reflecting knowledge of disease causation and prevention were associated on their own with significant differences in diarrhea prevalence among the index children. (See Table 6. Numbers with an asterisk indicate statistically significant prevalence ratios—percentage of children with diarrhea compared with other categories. A 1 indicates the reference category, the one with which the others are being compared.)

Only children whose caretakers thought that washing children's hands, supervising what they eat, washing fruits and vegetables, and washing kitchen utensils were important preventive actions had a lower prevalence of diarrhea. All such practices were protective against a recent diarrhea episode, reducing risk by about 40% when compared with children of mothers who thought that these practices were unimportant in diarrhea prevention.

Moreover, although the number who responded incorrectly was usually very small, almost 15% of mothers thought that washing children's hands was unimportant in preventing diarrheal disease. This is one area where information and education campaigns may have an impact on illness by changing beliefs and practices.

Table 6. Percentage of Children with Diarrhea Related to Caretaker's Knowledge

	% with Diarrhea	Prevalence Ratio	n	%
Keeping a Clean House				
Important	42.2%	0.87	367	93.1
Not important	48.1%	1.00	27	6.9
Don't know	37.5%		8	2.0
Unknown				
Total	42.6%		394	100.0
Boiling Water				
Important	39.6%	0.86	192	48.0
Not important	45.9%	1.00	185	46.3
Don't know	31.8%		22	5.5
Unknown			1	0.3
Total	40.3%		400	1.000
Washing Children's Hands				
Important	39.0%	0.62*	341	84.8
Not important	62.7%	1.00	59	14.7
Don't know	50.0%		2	0.5
Unknown				
Total	42.3%	c.i.=.49-.79	402	100.0
Washing Fruits and Vegetables				
Important	40.8%	0.59*	373	93.0
Not important	69.6%	1.00	23	5.7
Don't know	25.0%		4	1.0
Unknown			1	0.2
Total	41.9%	c.i.=.44-.79	401	100.0
Washing Kitchen Utensils				
Important	39.9%	0.61*	358	89.3
Not important	65.9%	1.00	41	10.2
Don't know	0.0%		2	0.5
Unknown				
Total	42.4%	c.i.=.47-.78	401	100.0
Breastfeeding				
Important	42.6%	0.95	350	87.3
Not important	44.7%	1.00	38	9.5
Don't know	33.3%		12	3.0
Unknown			1	0.2
Total	41.4%		401	100.0
Heating Leftovers				
Important	40.1%	0.81	222	55.2
Not important	49.6%	1.00	117	29.1
Don't know	37.1%		62	15.4
Heating Leftovers (Cont.)				
Unknown			1	0.2
Total	36.6%		402	100.0
Depositing Fecal Matter in Toilet				
Important	42.5%	1.24	346	86.1
Not important	34.2%	1.00	38	9.5
Don't know	57.9%		19	4.7
Unknown				
Total	39.7%		403	100.2
Supervising What Children Are Eating				
Important	39.8%	0.63*	352	87.6
Not important	63.4%	1.00	41	10.2
Don't know	50.0%		6	1.5
Unknown			3	0.7
Total	41.3%	c.i.=,48-.82	402	100.0
Washing Hands Before Cooking Food				
Important	41.3%	0.80	366	91.3
Not important	51.6%	1.00	31	7.7
Don't know	33.3%		3	0.7
Unknown			1	0.2
Total	41.6%		401	100.0
Washing Hands After Cleaning Dirty Diaper				
Important	41.8%	0.66	390	97.5
Not important	62.5%	1.00	8	2.0
Don't know	0.0%		1	0.3
Unknown			1	0.3
Total	42.0%		400	100.0

* Indicates statistically significant prevalence ratios at the .05 level.

6.3 Hygiene Behavior

The study next examined the relationship between reported and observed hygiene practices and diarrhea prevalence. The factors examined are shown in Table 7. While some practices are associated with diarrhea prevalence as expected, others show quite the opposite relationship. Some differences are weak in a statistical sense; however, they are reported here to show a

general tendency in favor of the better informed caretakers. Only three of the measures of household hygiene behavior are significantly related to the likelihood that the child has diarrhea.

Table 7. Prevalence of Diarrhea According to Hygiene Behaviors (Reported and Observed Behavior)

Reported Behavior	% with Diarrhea	Prevalence Ratio	% Positive Response	Total n
Handwashing After Cleaning Child's Bottom				
Rag	30.2(16)	0.70	13.0	52
Water	46.8(51)	1.08	27.1	109
Soap & water	43.2(102)	1.00	58.7	236
Other	20.0(1)	-	1.2	5
Total	42.2(170)		100.0	402
Disposal of child's feces				
Toilet	38.6	1.0	83.8	336
Rubbish, outside, buried	65.6	1.7**	15.0	60
Other	42.7	-	1.2	5
Observed Behavior	**% with Diarrhea**	**Prevalence Ratio**	**% Positive Response**	**Total n**
Rubbish on interior floor	50.0	1.00	22.4	90
No rubbish inside	40.4%	0.97	77.6	312
Total	42.5%		100.0	402
Human excreta outside	57.5	1.41*	10.0	40
No visible excreta outside	40.7	1.00	90.0	361
Animal excreta outside	46.5	1.13	21.4	86
No animal waste visible	41.3	1.00	78.8	316
Any excreta (animal or human, in or out) observed	49.6	1.27*	29.4	117
No excreta observed	39.1	1.00	70.6	281
Food not covered	47.9	1.16	12.0	48
Food covered	41.4	1.00	87.5	351
Don't know/no answer			1.0	2
Place to wash, soap present	48.0	1.00	37.3	150
Place to wash, no soap	36.5	1.31	39.6	159
No washing place	43.5	1.10	23.2	93
Washed hands with water only (women accepting to demonstrate only)	45.4	1.07	37.4	141
Washed hands with water and soap	42.4	1.00	62.6	236
Flies in kitchen – many	42.5	0.97	21.7	87
A few flies present	43.1	0.96	48.4	194
No flies observed	41.2	1.00	29.7	119

* Indicates statistically significant prevalence ratios at the .05 level.
** Indicates statistically significant prevalence ratios at the .01 level.

Improper disposal of children's feces raised the likelihood of diarrhea among the index children by about 70% (confidence limits around prevalence ratio = 1.36<1.7<2.13). This means that when a child's feces are not disposed of in a toilet (either excreted directly or deposited after excretion), the risk of diarrhea is between 1.3 and 2.1 times greater than when a mother reports

that excreta are disposed of properly. Where these facilities did exist, about one in six households did not use the toilets to dispose of children's waste.

The type of toilet facility available varied slightly, making it impossible to observe any difference in the risk of diarrhea according to access to toilets. Nevertheless, there is evidence that not all members of the household use these facilities regularly. Observers reported human feces visible outside the dwelling in about 10% of households. This raises the likelihood of a child having diarrhea by about 40% (confidence limits around prevalence ratio = 1.05 < 1.41<1.89). Visible excreta of any sort—human or animal—inside or outside the dwelling raises the likelihood of diarrhea by almost 30%, and this result just borders on statistical significance (confidence interval = 1.00 < 1.27<1.60).

The presence of human feces is highly correlated with not having a functioning latrine or toilet on the premises. Where inhabitants either use nature or a simple hole in the ground to relieve themselves, fecal matter was seen in 91% of the 22 households. The survey found human fecal matter in 26% of households with a turk (vast majority) or roman toilet. Although the number of households without a functioning latrine is small—only 6% of households did not have access to toilets—the difference in fecal contamination is striking.

While it cannot be ascertained that excreta is a direct contaminant of the water, hands, or food of young children in these households, it is probably safe to say that not using toilet facilities reflects the general level of cleanliness in certain households. It is clear that even in households with optimal facilities, hygienic practices could be improved.

Other studies have shown that the existence of a designated place for handwashing is a good approximation of actual practice and closely related to diarrheal disease prevalence. Similarly, this survey seems to indicate that having such a designated place but without the presence of soap increases the risk of diarrhea substantially (by over 30%). However, the statistical relationship found in this survey was weak because of the size of the sample.

6.4 Household Services

Almost all households in the sample have access to piped water (84%), and almost all of these households have a tap in their dwelling (78%). There is little variation in *who* has access to running water and adequate waste disposal—more than 80% of mothers with no education and 90% of those with some education had access to running water (data not shown). All households where the head had more than a primary education (32 in total) had access to a sewer, septic tank, or *puit perdu* for disposal of wastewater. However, 75% of households with heads who had a higher education were connected to the town sewer, as compared with only 55% of those with a primary education and 47% of households where the head had no education. Table 8 displays the relationship between the prevalence of diarrhea in the two weeks preceding the survey and sanitary arrangements in households.

Table 8. Diarrhea Prevalence by Household Environment (Weighted Bivariate Analysis)

Variable	% with Diarrhea	Prevalence Ratio	% with Facility Type	Total n
Water source				
Tap water-	40.4	0.57*** (0.45 – 0.73)	83.8	337
Protected, treated well, or other source	30.0	0.42*** (0.23 – 0.78)	6.7	27
Unprotected, untreated well, or other source	70.0	1.00	9.2	37
Water source (tap only)				337
Tap water in dwelling	39.0	0.72	78.9	313
Tap water outside dwelling	54.0	1.00	6	24
Water treatment (no taps)				
Treated water	32.1	0.46** (0.26 – 0.83)	45.0	28
Untreated	69.2	1.00	45.0	39
Don't know	62.5		9.6	8
Reported disposal of wastewater				
Sewer connection	41.4	1.00	50.4	202
Puit perdu	23.1	0.56	6.5	26
Septic tank	48.9	1.18	33.9	135
In street	40.6	0.98	8.0	32
Other	40.0	0.97	1.2	5
Working refrigerator	47.9	1.00	33.4	134
No refrigerator	41.4	0.84	65.8	264
Combined facilities				
Potable water* and sewer connection* ("full access")	41.5	1.00	77.8	311
Potable water, no sewer	28.3	0.68 (0.44-1.07)	13.2	53
Sewer but no potable water	76.9	1.85 (1.45 – 2.38)**	6.5	26
Neither potable water nor sewer	50	1.21 (0.64-2.27)	2.5	10

* "Potable" water is defined as water from a tap (in or outside dwelling, or water from another treated, protected source). Households with sewer connection include those with septic tanks, which are sanitary means of waste disposal.

** Indicates statistically significant prevalence ratios at the .01 level.

*** Indicates statistically significant prevalence ratios at the .001 level.

6.5 Water Source

If unprotected, untreated water sources are used as a reference category, children in households with access to tap water are about 40% less likely to have diarrhea than children where only untreated, nontap sources are used. Almost 10% of households use untreated, nontap sources of water. Children with access to protected and treated sources of water (e.g. covered well or other treated source) were almost 60% less likely to have a case of diarrhea in the same two-week period prior to the survey. The risk is greater, however, for those households with access only to

a tap outside their dwelling. In these households, 54% of the children had diarrhea in that same two-week period. This may indicate that tap water in the house is safer, but because the number of households with outside taps is small, this should be researched in other communities with a more mixed access to water inside or outside the residences.

Although the vast majority of households have access to tap (running) water, the diarrheal disease data suggest that water quality should be investigated further. These households rarely treat their water—only 5% report any treatment of tap water in the home (by boiling, filtering, or adding bleach).

6.6 Water Treatment

For nontap users, treatment of the water source is strongly protective; there is more than a 50% lowered risk if the source is treated. The five "don't know" responses on the questionnaire may refer to those who receive their water supply from a truck (total = 5) and would not know if the water they get is treated at the source or not. Four children from these five households reported having diarrhea.

6.7 Wastewater Disposal

Wastewater disposal, as measured through reports and observations, was not associated with significant differences in diarrhea prevalence. For the purposes of this study, a composite variable was constructed measuring access to both potable water (i.e. water from a tap or from a protected, treated well) and sanitary waste disposal facilities (connection to town sewer system or to septic tank). The prevalence of diarrhea among households thus categorized can be seen in the last section of Table 8 on *combined facilities*. Households with no access to potable water were clearly at higher risk of childhood diarrhea—about 85% more likely to have a reported case than households with both tap water and sewer connections. However, less than 7% of the sample fell into this category. Comparisons between "full access" and the other categories listed did not reach any statistical significance.

One conclusion from this analysis is that the *quality* of tap water should be examined, if this has not already been done. Because of the small number of families that treat their tap water by boiling, filtering, or adding bleach, it is impossible to determine whether these actions are important in preventing diarrhea, but this possibility should not be overlooked.

The difference in risk of diarrhea between the majority of households that have access to tap water and the smaller number of households that have protected and treated wells may have more to do with a general attitude toward household hygiene and health than with the actual quality of the water consumed. In other words, households in communities that take special steps to treat their wells may also be more aware of and likely to practice good hygiene in general. They may be more likely to wash themselves, their children, the food they eat, and the utensils they use for eating, drinking, and cooking than the average family. The hypothesis that a

relationship may exist between water treatment and household-level hygiene needs further investigation, because water treatment is a municipal function and not a household function.

Study findings suggest that the method of wastewater disposal, as measured in this survey, is not a good predictor of diarrhea prevalence. Rather, it seems that hygienic behaviors surrounding actual use of sanitary waste disposal facilities are more strongly associated with the prevalence of childhood diarrhea in these communities (see Table 8).

Based on the data collected in this survey, it is impossible to discern all the differences among households that could account for differences in childhood illness. It is obvious, however, that there are a number of ways in which diarrhea prevalence might be lowered in these neighborhoods. It would be beneficial to determine which factors are most important in lowering the risk of diarrhea and whether any of the associations change when allowing for the different types of determinants or predictors of diarrhea. Estimating the impact of improved hygiene behaviors in the presence and absence of adequate sources of water supply would also be useful.

7 Identifying Independent Predictors of Diarrhea Prevalence (Multivariate Analysis)

This section explores the knowledge and behavioral risk factors discussed in the previous section to determine whether such factors add any protection against diarrhea, taking into account the differences in households' water sources.

As discussed earlier, the study explored the relationship between the mother's education, the household's source of water, and diarrhea prevalence, because in other contexts it appears that improved facilities may have a greater effect in households where the mother is uneducated. However, because so little variation exists among mothers in this sample, it was difficult to make any firm conclusions in this regard.

The analysis discussed here combines the variable that measures water source with other potential predictors of childhood diarrhea such as knowledge, behavior, and feeding practices. The aim of this analysis is to identify any indicators that may be independent predictors of the impact of improvements in the health status of children in Morocco. This analysis uses only those variables that have been identified as important predictors on their own. The following sections examine the relationship between a set of *proximate determinants* of childhood illness, accounting for the household water source and the prevalence of diarrhea. Section 7.4 combines the most important factors in one analysis, which should help identify several independent indicators of the risk of childhood diarrhea.

7.1 Knowledge and Diarrheal Disease

Considering the effect of water supply, when comparing the four strong indicators of correct *knowledge* of how to prevent diarrhea, only two of the four—"washing child's hands" and "washing kitchen utensils"—have an independent effect on the likelihood that a child will have diarrhea (see Table 9). (The other two indicators were "washing fruits and vegetables" and "supervising what children eat.") Washing kitchen utensils has not been reported in the literature as an independent predictor of diarrhea. It may act more as a proximate for good domestic hygiene practices.

As Table 9 indicates, when type of water source is held constant, the strongest relationship of knowledge of preventive practices to diarrhea prevalence is found for "washing children's hands." Irrespective of the source of their water supply, children of mothers who did *not* believe that handwashing was an important preventive action were almost three times as likely to have diarrhea as those whose mothers indicated the importance of such action. Children of mothers who believed washing utensils was *unimportant* were almost twice as likely to have diarrhea as children whose mothers thought this was an important preventive action. Water source remained

an important factor, with those having an untreated source almost three and a half times more likely, and those with a treated, protected water source almost 40% less likely to have diarrhea as a child whose family had access to tap water.

Further efforts to educate mothers about the importance of these preventive actions may be fruitful. More mothers answered incorrectly the question regarding the importance of washing a child's hands in preventing diarrhea (15% said this was not important) than the second question regarding washing kitchen utensils (only 10% said this was not important). Hence, campaigns to increase preventive actions may have a greater impact if they focus on the importance of washing children's hands.

Table 9. Effect of Knowledge Factors on Likelihood of Diarrhea in Households, Allowing for Water Source

Variable	Odds of Diarrhea, Controlling for Each Variable	Lower Bound	Upper Bound
Water Source			
Treated, protected well or other treated source	0.6	0.2	1.59
Untreated, unprotected well or other source	3.4*	1.2	9.14
Washing kitchen utensils unimportant	1.9	0.9	4.1
Washing child's hands unimportant	2.9*	1.5	5.7

Note: Lower and upper bounds account for margin of error.
* Indicates statistically significant prevalence ratios at the .05 level.

7.2 Behavior and Diarrheal Disease

When comparing households with different water sources according to *preventive behaviors*, the only action measured in this survey that maintains a strong effect on diarrhea prevalence is "correct disposal of child's feces" (see Table 10). Although household water source remains important, children of mothers who report disposal of children's feces in the rubbish, outdoors, or by burying are almost two and a half times more likely to have diarrhea than those who deposit the feces in a toilet. Almost 40% of caretakers reported incorrectly disposing of children's feces.

Table 10. Effect of Behavior on Likelihood of Diarrhea in Households, Allowing for Water Source

Variable	Odds of Diarrhea, Controlling for Each Variable	Lower Bound	Upper Bound
Water source			
Treated, protected well or other treated source	0.5	0.2	1.3
Untreated, unprotected well or other source	3.2*	1.2	8.6
Incorrect disposal of child's feces	2.4*	1.3	4.5

Note: Lower and upper bounds account for margins of error.
* Indicates statistically significant prevalence ratios at the .05 level.

If the incorrect disposal of children's feces is truly a cause of diarrhea among sample households, then changing this behavior will have a stronger impact than changing a behavior that is less frequently reported. Educational interventions may be helpful in changing this practice.

7.3 Feeding Practice and Diarrheal Disease

The results of the analysis, as shown in Table 11, indicate that having an untreated water source is still an important independent predictor of diarrhea when age and feeding practice are allowed for. Age and feeding practice used probably measure the same thing since the variability by age is related to the feeding practices, and children fed only breast milk, or fed milk from a cup, are less likely to have diarrhea than other children. Not feeding children from a bottle appears to be a protective measure, but it is not as strong an independent predictor of diarrhea once differences in children's ages are considered. A child between six and 18 months of age has the highest risk—more than twice that of those under six months— even when the feeding method is allowed for. This means that in addition to bottle feeding, other factors are important in determining the higher risk of diarrhea experienced by children in the weaning ages. The only way to assess what these other factors are is to include all the important determinants in a single analytical model to see which are the best predictors of the risk of diarrhea.

Table 11. Effect of Type of Milk Feed on Likelihood of Diarrhea in Households, Allowing for Water Source

Variable	Odds of Diarrhea, Controlling for Each Variable	Lower Bound	Upper Bound
Water source			
Treated, protected well or other treated source	0.5	0.2	1.4
Untreated, unprotected well or other source	3.3*	1.2	8.9
Child 6-17 months	2.3	0.9	5.8
Child 18 months – 5 years	1.1	0.5	2.5
Child is not bottle fed	0.9	0.3	2.2

Note: Lower and upper bounds account for margins of error.

* Indicates statistically significant prevalence ratios at the .05 level.

7.4 Water Source and Independent Predictors of Childhood Diarrhea

To determine which indicators are the best measures of protection against diarrhea, the study analyzed the strongest factors from each group of *proximate determinants*—knowledge, hygiene behavior, feeding practice, and water source—and assessed the relative importance of each. These measures, if tracked over time, should provide an indication of the effectiveness of programs designed to improve the health status of children, specifically during the peak summer season. Tracking such *proximate* indicators of risk may be simpler and can indicate the effectiveness of educational and other measures taken to improve child health in this population.

Each of the variables in Table 12 was entered into a regression model[2], enabling reviewers to see the change in the effects of those variables considered first. The results of this analysis are explained in the following paragraphs.

Table 12. Best Predictors of Diarrhea Status, in Order of Strength

Variable	Odds of Diarrhea, Controlling for Each Variable	Lower Bound	Upper Bound
Washing child's hands unimportant	2.7*	1.3	5.3
Incorrect disposal of children's feces	2.1*	1.1	4.1
Washing kitchen utensils unimportant	2.1	0.9	4.6
Child 6-17 months	2.5	0.9	6.5
Child 18 months – 5 years	1.3	0.5	3.1
Water source			
Treated, protected well or other treated source	0.5	0.2	1.3
Untreated, unprotected well or other source	2.3*	0.8	6.7
Child is not bottle fed	0.6	0.2	1.1

* Indicates statistically significant prevalence ratios at the .05 level.

Coefficients for variables: -0.5342 constant; -0.7216 treated well water; 0.8248 untreated well water; 0.9131 age 6-17 months; 0.2663 18 months or more; 0.7490 improper disposal of children's feces; 0.7213 washing kitchen utensils unimportant; 0.9893 washing children's hands unimportant; and -0.5342 child is bottle fed.

Note: This table indicates the likelihood of diarrhea when all other factors in the model are held constant.

Water source loses some strength as a predictor of diarrhea when all other predictors are also considered. However, water supply remains one of the strongest predictors of diarrhea risk with diarrhea 2.3 times as likely to occur in households with an untreated water source than in households with tap water.

Ensuring that a child is not fed by a bottle is even more protective against the risk of diarrhea when the analysis allows for the mother's knowledge and other measures of hygiene behavior. All else being equal, children in any age group who are not bottle fed are about 40% less likely to have diarrhea.

Children between six and 18 months are at highest risk of diarrhea, even when mothers have access to good water, are knowledgable about preventive actions, and practice good hygiene.

Knowledge of preventive actions and proper hygiene behavior are very important in reducing the risk of diarrhea, all else being equal. Each of these variables independently can raise the risk of diarrhea almost 100%. This means that even in households with good water supplies, preventive actions are crucial in reducing the risk of diarrhea.

[2] This model has a log likelihood of –224.996, and the goodness of fit chi-square allows us to reject the null hypothesis of a poor fit. We also ran identical models including age in months, rather than the three age groups shown here, including a variable for "town." Neither the continuous age variable nor the variable for town changed the results or added to the predictive power of the model, and they are not shown here.

This analysis produced some important new results, specifically that the following behaviors and knowledge can improve the chances that a child in this population will remain healthy even when the household does not have access to a safe water supply:

- Improve knowledge that washing children's hands and keeping household utensils clean are ways to prevent diarrhea
- Ensure that children's feces are disposed of properly and ensure that family members use the toilet facilities available to them
- Reduce bottle feeding of children when they receive milk other than breast milk
- Treat well water and cover wells
- Increase household-level access to tap water
- Check the quality of tap water and, if found to be deficient, improve municipal-level water treatment or purify at the household level by boiling or filtering

7.5 Beliefs and Behaviors

As this study indicated, only a few questions related to the caretaker's knowledge of disease causation and prevention were important predictors of recent diarrheal illness. To further explore whether beliefs about illness prevention translate into actions taken to prevent diarrhea, the study examined the relationship between caretakers' beliefs and reports and observations likely to reflect behaviors.

When a small number of women exhibited a characteristic of interest (for example, an incorrect belief), reviewers were less likely to determine with reasonable confidence that the difference did not arise by chance. Those statements about ways to prevent diarrhea shown to have the strongest association with diarrhea prevalence—washing child's hands, washing fruits and vegetables, and disposing of child's excrement in a toilet—were compared with indicators of behavior. The results are shown in Table 13.

Only one finding is of interest. In households without a specified place to wash, fewer mothers believe that handwashing can prevent diarrhea. In almost 90% of households where the mother stated that washing a child's hands is important, observers verified that the household had a specified place to wash. While it is impossible to be sure that these mothers actually do wash their children's hands more often than those who think this is not an important preventive action, it appears that conditions in their households are more likely to lead to such actions. It seems reasonable to assume that, in this case, knowledge that washing is an important preventive action does indeed translate into action.

Table 13. Relationship Between Knowledge of Preventive Actions and Behavior

	% "Important" (n)	Prevalence Ratio	Total n
Washing child's hands			
No specified place to wash	73.6 % (67)	1.00	91
Place to wash (soap, no soap combined)	89.2% (274)	0.82 * *(0.72 – 0.93)	306
Missing			3
Washing fruits and vegetables			
No specified place to wash	96.7% (88)	1.00	91

	% "Important" (n)	Prevalence Ratio	Total n
Washing fruits and vegetables (cont.)			
Place to wash (soap, no soap combined)	93.4% (285)	1.04 (0.97 – 1.09)	305
Missing			6
Depositing fecal matter in toilet			
Child's feces disposed of in toilet	90.9% (293)	1.00	322
Child's feces disposed of in trash, outside, or buried	88.3 (53)	1.03 (0.93-1.14)	60
Missing			20

** Indicates statistically significant prevalence ratios at the .01 level.

7.6 Community-Level Variations

The final analysis explores the physical location of the sample households. While the numbers sampled are too small to detect significant differences in diarrhea prevalence among neighborhoods, these neighborhoods can at least be ranked according to reported diarrhea prevalence (Table 14a). Households with untreated, unprotected nontap water sources—those that appear to be most risky—can also be observed (Table 14b). There are only 29 such households, and 15 of them are found in the neighborhood of Chinette in Ouled Teima. (Perhaps coincidentally, Chinette also ranks first in prevalence of diarrhea among all the neighborhoods included in the sample.)

None of the households sampled in Maassar have access to tap water, but six of these eight households obtain their water from a protected, treated well or other source. Of the other households that obtain water from treated, protected wells, 43% are in the neighborhood of Boukhris and all are located in Ouled Teima. As indicated in Table 14a, Maasar and Boukhris rank lowest on prevalence of diarrhea out of all the sample neighborhoods.

Table 14a. Sample Neighborhoods Ranked in Order of Diarrhea Prevalence

Diarrhea Prevalence Ranking (Highest to Lowest)	Neighborhood
1	Chinette (Ouled Teima)
2	Ikou (Drarga)
3	Drarga Bas (Drarga)
4	Z. Sidiborg (Ouled Teima)
5	Taghzi (Drarga)
6	Ikou Khrib (Drarga)
7	El Glita (Ouled Teima)
8	Cite Mbarka (Ouled Teima)
9	Ikidar (Drarga)
10 (equal)	Ouled Fhal (Ouled Teima)
10 (equal)	Boukhris (Ouled Teima)
10 (equal)	Maassar (Drarga)

Table 14b. Percent of Households in Each Neighborhood and Town with Different Sources of Water (Unweighted)

Town	Neighborhood	Water Source			
		% with Tap water (n)	*% With Protected Treated Wells or Other Treated (n)*	*% Not Treated (n)*	*Total n*
Drarga	Maassar	0.0	75.0 (6)	25.0 (2)	8
	Ikou Khrib	100.0 (13)			13
	Taghzi	100.0 (18)			18
	Ikidar	100.0 (35)			35
	Drarga Bas	100.0 (53)			53
	Ikou	100.0 (73)			73
	Subtotal	96.0 (192)	3.0 (6)	1.0 (2)	200
Town	**Neighborhood**	**Water Source**			
		% with Tap Water (n)	% with Protected Treated Wells or Other Treated (n)	% Not Treated (n)	Total n
Ouled Teima	Boukhris	12.5 (2)	50.0 (8)	37.5 (6)	16
	El Glita	91.3 (21)	8.7 (2)	0	23
	Ouled Fhal	50.0 (4)	37.5 (3)	12.5 (1)	8
	Chinette	76.3 (58)	3.9 (3)	19.7 (15)	76
	Cite Mbarka	96.0 (24)	4.0 (1)	0	25
	Z. Sidiborg	88.7 (47)	1.9 (1)	9.4 (5)	53
	Subtotal	77.6 (156)	9.0 (18)	13.4 (27)	201
Grand Total		86.8**(348)**	6.0**(24)**	7.2**(29)**	**401**

Nontap sources of water are highly clustered, and it appears that diarrhea prevalence is similarly clustered. There may be clustering of other characteristics in these neighborhoods that contribute to higher levels of childhood morbidity, and these can be elicited with further data analysis.

While a communal-level impact of tap water and sewage connection on diarrheal disease morbidity would be expected, the high percentage of households with access to these services makes such a finding improbable. Such an impact assessment would require data from communities with a much more diverse access to water and sanitation services.

8 Conclusions and Recommendations

This survey has provided some important insights into the role that access to safe water and sanitary facilities plays in two Moroccan towns. Although the survey respondents are far less educated than most Moroccans and resemble more closely people from rural communities rather than from urban areas, most households in these neighborhoods have good access to running water. Almost three-fourths of the households have both tap water and a sewer or septic tank connection.

8.1 Key Indicators of Impact and Effectiveness

This section reviews some of the key study findings related to childhood diarrhea.

Access to a sewer connection or to a septic tank is not strongly associated with diarrhea prevalence. Rather, the data strongly suggest that proper *use* of waste disposal facilities is a better indicator of whether a family is likely to have a child with diarrhea or not. Although 96% of households have access to a toilet facility, 15% of respondents reported improper disposal of children's feces. Animal or human excreta was observed around or inside 30% of the dwellings, thereby indicating the importance of improving hygiene behaviors in many households in these communities. Households where excreta are disposed of properly are less likely to have a child ill with diarrhea.

The observation of excreta inside or outside the dwelling may reflect a more general picture of household hygiene. Although conclusions could not be drawn about the direct contamination of children's feeds with fecal matter, this observation indicates that the general level of cleanliness in some households needs to be improved.

Running water from a tap seems to be a safe source of water. However, findings imply that tap water *quality* may need to be improved, especially when accessed outside the household, by improving municipal-level water treatment or purifying at the household level by boiling or filtering to destroy pathogens.

Not surprisingly, water sources are highly clustered among communities, and the clustering of the riskiest water sources appears to be associated with the risk of diarrhea in these communities.

Families without access to tap water who treat their water at the source (from a protected well) have the lowest risk of childhood diarrhea. In addition to ensuring that their wells are covered or treating their water, they may be more likely to practice better general hygiene, such as washing hands more often, covering food and water storage containers, and depositing excreta in toilets, than other households. In other words, this finding may indicate more widespread preventive

actions among these households than simply ensuring that the well water used for drinking is treated.

Without accurate information about the causes of childhood illness, even the best water supply and sanitary arrangements are not sufficient. When mothers say they are aware of the importance of washing children's hands, fruits and vegetables, and kitchen utensils, and supervising what their children eat, the risk of diarrhea among children under five is lower. This analysis shows that there is a need for better information and encouragement to families in these communities to take an active role in preventing diarrhea.

Previous studies have suggested that to be successful, information campaigns to increase preventive actions should focus on one or two key practices (Huttly, *et al*,1997). The findings from this survey suggest that the focus in these neighborhoods should be on encouraging disposal of children's feces in toilets, rather than in the rubbish or outside the dwelling, and making mothers aware of the importance of washing children's hands.

Because the riskiest age for diarrhea is between six and 18 months, mothers should be encouraged to reduce the use of bottle feeding, which can be a factor in contracting diarrhea in that age group. Among children who drink milk other than breast milk, those who drink from a cup have a lower prevalence of diarrhea. Dirty bottles, or feeds made with contaminated water, may be an important cause of diarrhea, especially among the youngest children, who should be receiving only breast milk.

8.2 Potential for Change

The probability of diarrhea in the sampled households was about 0.42 among children under five—one in every 2.3 children in the sample was a reported case. As a result of this study, one can calculate the impact that making changes in household environment and hygiene practices would have on the prevalence of diarrhea. For example, using the data from the final regression equation (see Table 12), for a child living in a household in a "worst case" scenario, the probability of contracting diarrhea increases to almost 1. (The "worst case" scenario is a household where the child is between six to 17 months old and is bottle fed with untreated water, and the mother does not dispose of the child's feces in a toilet, nor does she believe that handwashing and washing cooking utensils are important.) In such a scenario, 97 of every 100 children would have diarrhea.

In a "best case" scenario where the child is less than six months and is not bottle fed, the family uses treated well water, and the mother disposes of the child's feces in the toilet and believes that handwashing and washing cooking utensils are important preventive actions, the prevalence of diarrhea might be reduced substantially during the high season. For these children, the risk decreases to 0.14, or one child in every seven having an episode.

It has been suggested that the high prevalence of diarrhea found during the summer months in these neighborhoods merely reflects eating too much fruit. If eating fruit was the only cause of reported cases of diarrhea, it is unlikely that this survey would have found such strong

associations between diarrhea and risk factors related to parental knowledge, hygiene behavior, and household environment.

In addition to supervising what a child eats, there are a number of important interventions that can be taken to reduce the risk of diarrhea in this population. These include treating and protecting existing wells, boiling or filtering other water sources if necessary, reducing bottle feeding, and improving household hygiene. Since almost all households have toilet facilities and sanitary waste facilities, proper disposal of children's feces is one action that can be taken immediately if parents are made aware of its importance. Mothers need to understand the importance of the child's personal hygiene, especially handwashing. Since households have ready access to running water, increasing this practice also should be possible.

The neighborhoods included in this study may benefit only from programs that aim at reducing risk factors of childhood diarrhea in specific areas where a relatively large proportion of caretakers showed inappropriate behavior. For example, over half of the caretakers did not consider washing fruit and kitchen utensils important for preventing diarrhea. Concerning access to clean water sources and sanitation and other important hygiene behaviors (such as handwashing or child feeding), these study results could be more relevant to other communities in the Souss Massa and Dráa regions where larger population segments are exposed to diarrheal disease risk factors. Additional or different risk factors than those that were prominent in the Drarga and Ouled Teima neighborhoods may play a role elsewhere in southern Morocco and should be known when establishing priorities for interventions.

References

Ashworth A (1998). Nutrition interventions to reduce diarrhoea morbidity and mortality. Proc. of the Nutrition Society, 57:167-174.

Ashworth A, Feachem RG (1985). Interventions for the control of diarrhoeal diseases among young children: weaning education. Bull.WHO, 63:1115-1127.

Bairagi R, Chowdhury MK, Kim YJ, Curlin GT, Gray RH (1987). The association between malnutrition and diarrhoea in rural Bangladesh. Int'l J. Epidemiology, 16(3): 477-481.

Baqui AH et al, (1992). Epidemiological and clinical characteristics of acute and persistent diarrhoea in rural Bangladeshi children. Acta Paediatrica, Suppl. 381: 93-97 (cited in Huttly et al 1997)

Curtis V, Cousens S, Mertens T., Traore E., Kanki B, Diallo I (1993). Structured observations of hygiene behaviours in Burkina Faso: validity, variability, and utility. Bull. WHO, 71(1): 23-32.

Daniels DL *et al* (1990). A case-control study of the impact on diarrhoea morbidity of improved sanitation in Lesotho. Bull. WHO, 68: 455-463.

David CB, David PH (1984). Bottle-feeding and malnutrition in a developing country: the 'bottle-starved' baby. J. Tropical Pediatrics, 30:159-164, June.

David CB, David, PH, Lozy M (1983). Determinants of breastfeeding duration and nutrition in a transitional society. J. Tropical Pediatrics, 29:45-49, February.

AHRTAG (1989). Investigating beliefs: research methods, *Dialogue on Diarrhoea* (1989) 39: December: 2.

Esrey S (1991). Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, trachoma. Bull.WHO, 69: 609-621.

Esrey SA (1996). Water waste and well-being: a multi-country study. Amer. J. Epid., 143: 608-623.

Esrey SA, Habicht J-P (1988). Maternal literacy modifies the effect of toilets and piped water on infant survival in Malaysia. Amer. J. Epidemiology, 127:1079-1087.

Feachem RG, Hogan RC, Merson MH (1983). Diarrhoeal disease control: reviews of potential interventions. Bull. WHO 61(4): 637-640.

Feachem RG, Koblinsky MA (1984). Interventions for the control of diarrhoeal diseases among young children: promotion of breast-feeding. Bull. WHO 62(2): 271-291.

Feachem RG (1984) Interventions for the control of diarrhoeal diseases among young children: promotion of personal and domestic hygiene, Bull.*WHO* 62(3): 467-476.

Gordon JE, Chitkara ID, Wyon JB (1963). Weanling diarrhea. The American J. of Medical Sciences, March, 245:129-161.

Huttly SRA, Morris SS, Pisani V (1997). Prevention of diarrhoea in young children in developing countries. Bull. World Health Organization, 75(2):163-174.

Macro International (1997). Interviewer's Manual: PhaseIII, DHS-III Basic Documentation No. 3, Calverton, Maryland.

Manun'Ebo M, Cousens S, Haggerty P, Lakengaie M, Ashworth A, Kirkwood B (1997). Measuring hygiene practices: a comparison of questionnaires with direct observations in rural Zaire. Tropical Medicine and Hygiene, 2(11):1015-1021.

Mosley WH, Chen, LC (1984). An analytical framework for the study of child survival in developing countries, Child Survival: Strategies for Research. Population and Development Review, Supplement to Vol. 10:25-48.

Mosley WH, Becker S (1991). Demographic models for child survival and implications for health intervention programmes. Health Policy and Planning September 6(3):218-33.

Studies in Family Planning (1996). Data: Morocco 1995: Results from the Demographic and Health Survey. (6):344-348.

UNICEF (1995). *Monitoring Progress Toward the World Summit for Children: A Practical Handbook for Multiple-Indicator Surveys*, New York.

VanDerslice et al (1994). cited in Huttly, et al, 1997.

Victora C *et al* (1989). Infant feeding and deaths due to diarrhoea: a case-control study. Amer. J. Epidemiology., 128:1032-1041.

WHO (1997). Household Survey Manual: Diarrhoea and Acute Respiratory Infections. Division for the Control of Diarrhoeal and Acute Respiratory Disease, Geneva.

WHO (1999). World Health Report, Geneva: World Health Organization.

Yacoob M (1999). Report to USAID and EHP.

Appendix A: Survey Questionnaire

Numéro d'Ordre __ __ __ **Numéro d'Echantillon: Base** ____ **Remplaçement** ____

Numéro D'Identification du Questionnaire __ __ __ __ / __ __ __ __ **(Quartier / Maison)**

ROYAUME DU MAROC

PROJET DE SANTE ENVIRONNEMENTALE/USAID
MUNICIPALITES DE DRARGA ET OULED TEIMA
MINISTERE DE LA SANTE

ETUDE AUPRES DES MENAGES SUR LA PREVALENCE DES MALADIES DIARRHEIQUES ET DES FACTEURS DE RISQUE ENVIRONNMENTAUX ET COMPORTEMENTAUX Y AFFERENTS

AOUT 1999

PRESENTATION DES OBJECTIFS DE L'ENQUETE
(A Présenter par l'Enquêteur)

Salaam Aalikum. Mon nom est _____.

Nous sommes une équipe de la municipalité et de la santé dans une étude financée par l'USAID (les Américains) qui vise l'amélioration de la santé de la mère et de l'enfant, spécifiquement pour détecter les causes de la diarrhée dans le quartier et dans les ménages. Votre maison a été choisie à partir d'un tirage au sort.
Toutes ces informations sont strictement confidentielles.

CODES

Le code d'identité unique du questionnaire = 8 caractères: 4 lettres pour la localité, 4 chiffres pour le ménage. Seul le Superviseur remplit le code sur la première page; l 'enquêtrice le remplit sur les autres pages.

VILLE	LOCALITE	CODE
DRARGA	Drarga Bas	DGBA
	Igou Khrib	DGIK
	Iguidar	DGIG
	Ikiou	DGIU
	Massar	DGMR
	Tighza	DGTZ
OULED TEIMA	Boukhriss	OTBK
	Chninette	OTCH
	Cité Mbarka	OTMB
	El Glita	OTGL
	Ouled Fahl	OTOF
	Zaouet Sidi Borg	OTSB
QUARTIER TEST	Chrarda	OTQT

CONTROLE DE QUALITE

SUPERVISEUR	DATE	INITIALES	CODE
A. Interview incomplète et remplacée			
B. Interview complète et revue			
1. Pas d'erreurs ou omissions			
2. Présence d'erreurs ou omissions			
C. Erreurs ou omissions corrigées			
OPERATEUR DE SAISIE			
D. Saisie par			

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

I. VISITES ET PERMISSIONS

INFORMATIONS	N° de la visite			INSTRUCTIONS
	1ère	2ème	3ème	
1. Code de l'enquêtrice				Mettez votre code
2a. Date de la visite **(JJ/MM)**	_ _ / _ _	_ _ / _ _	_ _ / _ _	Jour / Mois
2b. Heure de l'interview **(HHMN)**	_ _ / _ _	_ _ / _ _	_ _ /_ _	Quand on arrive à la maison
3. Maison habitée	O N			Si OUI, aller à Q4 Si NON, retourner le (Q.) au superviseur
Décision du superviseur Maison inhabitée remplacée par famille/ménage ID N°_____				
4. Le chef de la famille choisie est-il présent?	O N	O N	O N	Si OUI, aller à Q4a Si NON, aller à Q5
4a. Puis-je lui parler?	O N	O N	O N	Si OUI, aller à Q7 Si NON, aller à Q5
5. Y a-t-il un adulte résident dans cette famille présentement à qui je peux parler? (Préciser le statut)	O N ____	O N ____	O N ____	Si OUI, aller à Q7 Si NON, aller à Q6 1=Epouse, 2=Belle-Mère/Sœur, 3 = Fille/Fils Adulte, 4=Autre (A préciser)
6. Quand pourrai-je revenir rencontrer un adulte résident dans cette famille présentement à qui je peux parler ? **(JJ/MM) et (HH/MN)**	_ _ / _ _ _ _ / _ _	_ _ / _ _ _ _ / _ _		**Si oui aller à Q7** **Si pas d'adulte présent à la visite 3** Retourner le Q au Superviseur
Décision du superviseur chef de famille ou son remplaçant absent remplacée par famille/ménage ID N°_____				
7. Combien de ménages avec enfants de < 5 ans (habitant dans cette maison) existe-il dans la maison? **(nombre de ménages)**	----------	----------	----------	Si > 1, en choisir un (1) au (tirage au sort) puis aller à Q 8 Si = 1 aller à Q 10 Si néant, retourner le Q au superviseur
Décision du superviseur pas d'enfant de moins de 5 ans remplacée par famille/ménage ID N°_____				
8. Le chef du ménage tiré au sort est-il présent?	O N	O N	O N	Si OUI, aller à Q 8a Si NON, aller à Q9
8a. Puis-je lui parler?	O N	O N	O N	Si OUI, aller à Q10 Si NON, aller à Q9
9. Y a-t-il un adulte résident dans ce ménage présentement à qui je peux parler? (Préciser le statut)	O N ____	O N ____	O N ____	Si OUI, aller à Q10 Si NON,aller à 9a 1 = Epouse, 2 = Belle-Mère/Sœur, 3 = Fille/Fils Adulte, 4 =Autre (A préciser)
9a Quand pourrai-je revenir rencontrer un adulte résident dans ce ménage présentement à qui je peux parler ? **(JJ/MM) et (HH/MN)**	_ _ / _ _ _ _ / _ _	_ _ / _ _ _ _ / _ _		**Si rencontrer aller à Q10** **Si pas d'adulte présent à la visite 3** Retourner le Q au Superviseur
Décision du superviseur chef de ménage ou son remplaçant absent remplacée par famille/ménage ID N°_____				
10. Y a-t-il des femmes adultes habitant dans ce ménage prenant soins des enfants de < 5 ans?	O N	O N	O N	Si OUI aller à Q11 Si NON, pas de femme, retourner le Q au Superviseur
Décision du superviseur Pas de femmes adultes prenant soins des enfants remplacée par famille/ménage ID N°_____				
11. M'autorisez-vous à parler avec elles?	O N	O N	O N	Si OUI, aller à Q12 (à adresser aux femmes avec enfants de moins de 5 ans) Si NON, Retourner le Q au Superviseur
Décision du superviseur pas d'autorisation de parler aux femmes remplacée par famille/ménage ID N°_____				
12. Sont elles (êtes-vous) disponibles actuellement?	O N	O N	O N	Si OUI, aller à Q14 Si NON, aller à Q13
13. Quand pourrai-je revenir lui / leur parler? **(JJ/MM) et (HH/MN)**	_ _ / _ _ _ _ / _ _	_ _ / _ _ _ _ / _ _		Femme pas disponible Retourner le Q au Superviseur
Décision du superviseur femme pas disponible remplacée par famille/ménage ID N°_____				
14. Puis-je vous poser quelques questions dès que je termine avec cette personne?	O N	O N	O N	Si oui aller à Q15 Si non retourner le Q au superviseur

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

II. CARACTERISTIQUES DU MENAGE (Questions à adresser à la personne autorisant l'interview)

15-.Ethnie et langue utilisée dans l'interview

15 a -Est-ce que vous êtes Arabe ou Berbère ou autre chose? (Encercler le code correct)

Arabe 1 Berbère 2 Autre 3 A Préciser _____

15 b Langue utilisée

Arabe 1 Berbère 2 Français 3 Autres 4 A Préciser _____

16. Etes-vous propriétaire de la maison? (Encercler le code correct) O N

Si OUI, aller à Q17

Si NON, en quelle qualité occupez-vous la maison?

Locataire 1 Maison de service 2 Don des parents 3 Autre 4 A Préciser _____

17. Taille du ménage par age et par sexe (Remplir le tableau suivant)

A. Tranche d'Age	SEXE	
	Masculin	Féminin
Moins de 5 ans		
5 ans et plus		

(Si pas d'enfant < 5 ans (0-59 mois), retourner le Q au Superviseur pour remplacement)

18. Quel est le sexe du chef de ménage? H F

19. Quel est le niveau le plus élevé d'étude du chef du ménage? (Encercler une réponse)

Primaire	1	Collège	2
Lycée	3	Formation technique	4
Faculté	5	Ne sait pas	6
Aucune	7	Autres	8

20. Quelle est la situation matrimoniale du chef du ménage **(**Encercler une des propositions suivantes)

Célibataire	1	Marié(e)	2
Divorcé(e)	3	Veuf (ve)	4

21. Combien de mères ayant des enfants de < 5 ans existe-il dans ce ménage? (Mettre le chiffre) ____

(En présence de plus d'une femme avec enfants de moins de 5 ans, retenir toutes les femmes avec un questionnaire unique pour chacune)

(Remercier le chef / autre personne et adressez-vous à la première personne (mère de préférence) prenant soins des enfants de moins de 5 ans)

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

II. IDENTIFICATION DE LA PERSONNE PRENANT SOIN DES ENFANTS

22. Code de la Femme ___ (1 = Première, 2 = Deuxième, etc.)

23. Heure du début de l'interview de la femme __ __ /__ __ (HH/MN)

24. Quel est votre prénom? (Nom) _____ Age (Ans) _____

25. Relation à l'enfant Mère 1 Grand'mère 2 Belle-Mère 3 Belle-Sœur 4

Sœur 5 Tante 6 Autre 7 A Préciser _____

26. Avez -vous fréquenté l'école? O N (Si NON, aller à Q28)

27. A quel niveau scolaire le plus élevé avez-vous arrêté vos études? (Encercler la réponse)

a. Primaire	1	
b. Collège	2	
c. Lycée	3	
d. Faculté	4	
e. Autre	5	(A Préciser _____)

(Aller à la Q29)

28. Pouvez-vous lire et comprendre une lettre ou un journal? (Encercler la réponse)

a. Facilement	1
b. Avec difficulté	2
c. Pas du tout	3

III. PREVALENCE DES MALADIES DIARRHEIQUES

29. Je voudrai connaître les noms de vos enfants âgés de moins de 5 ans. Demandez successivement -- leurs nom, sexe, âge en mois révolus (date de naissance exacte si possible à partir d'un carnet de santé), diarrhée (plus de 3 selles liquides par jour) au cours des derniers 15 jours, et statut actuel (Code 1= Guéri, 2 = Diarrhée persistante,
3 = Enfant décédé)

ID	Prénom	Sexe	Date de Naiss. (JJ/MM/AA) ou âge en mois	Diarrhée (Depuis 15 j.)	Sang ou glaires	Statut Actuel
1		M F		O N	O N NSP	1 2 3
2		M F		O N	O N NSP	1 2 3
3		M F		O N	O N NSP	1 2 3
4		M F		O N	O N NSP	1 2 3
5		M F		O N	O N NSP	1 2 3

S'il y a plus d'un enfant âgé de 0-59 mois, en choisir un au hasard avec un tirage au sort à partir des morceaux de papier numérotés de un jusqu'au nombre d'enfants. Encercler le numéro d'identification de l'enfant choisi dans la colonne ID dans le tableau ci-dessus.

Numéro D'Identification du Questionnaire __ __ __ __ / __ __ __ __ **(Quartier / Maison)**

IV. POUR L'ENFANT CHOISI CI-DESSUS

A. SOURCE DE LAIT POUR L'ENFANT CHOISI AU HASARD (Pas nécessairement un enfant avec diarrhée)

30. Durant les derniers 15 jours, quel type de lait boit-il/elle? (Cocher toutes les réponses données)

a. Maternel	☐	
b. Lait frais pasteurisé	☐	
c. Lait frais non-pasteurisé	☐	
d. Lait en poudre	☐	
e. Lait concentré	☐	
f. Néant	☐	
g. Autre	☐	A Préciser _____

(Si seulement Maternel ou Néant, aller à Q32)

31. Dans quoi boit-il/elle le lait? (Cocher toutes les réponses données)

a. Biberon	☐	
b. Cuillière	☐	
c. Tasse / verre / pot	☐	
d. Autre	☐	A Préciser _____

B. SOURCE D'EAU POUR L'ENFANT CHOISI

32. Quelle eau cet enfant boit-il/elle? (Cocher toutes les réponses données)

a. Robinet dans la maison	☐	
b. Puits	☐	
c. Forage/borne fontaine	☐	
d. Eau minérale en bouteille	☐	
e. Colporteur	☐	
f. Autre	☐	A Préciser _____

33. Cette eau est-elle traitée à la maison avant de la donner à l'enfant? O N
Si NON, aller à Q35

34. Quel sont les traitements effectués à la maison pour cette eau? (Cocher toutes les réponses données)

a. Eau bouillie	☐	
b. Filtrage	☐	
c. Eau de javel	☐	
d. Autre	☐	A Préciser _____

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

V. CONNAISSANCES DE LA MERE / PERSONNE CHARGEE DE L'ENFANT CHOISI

35. En générale, quand croyez-vous faut-il se laver les mains avec de l'eau seulement?
Ne suggérer pas. Cocher toutes les réponses données, puis demander: C'est tout?

a. Avant de manger ☐
b. Après avoir mangé ☐
c. Avant de préparer la nourriture ☐
d. Avant de donner à manger aux enfants ☐
e. Après avoir fait les besoins ☐
f. Après avoir nettoyé un enfant après défécation ☐
g. Quand on se réveille ☐
h. Ne sait pas ☐
i. Autre ☐ A Préciser _____

36. En générale, quand croyez-vous faut-il se laver les mains avec de l'eau et du savon?
Ne suggérer pas. Cocher toutes les réponses données, puis demander: C'est tout?

a. Avant de manger ☐
b. Après avoir mangé ☐
c. Avant de préparer la nourriture ☐
d. Avant de donner à manger aux enfants ☐
e. Après avoir fait les besoins ☐
f. Après avoir nettoyé un enfant après défécation ☐
g. Ne sait pas ☐
h. Autre ☐ A Préciser _____

37. La question suivante concerne les causes possibles de diarrhée chez les enfants.
(Encourager la femme de bien réfléchir si elle répond, NSP)

D'après vous quelle serait les causes principales de diarrhée chez les enfants < 5 ans? _____

38. Maintenant je vais vous lire quelques possibilités et pour chaque article dites-moi si vous le croyez être une cause importante ou pas importante dans la présence de la diarrhée chez les enfants de moins de 5 ans.
(Lire chaque article à haute voix et encercler le code de la réponse)

Article	Important	Pas Important	NSP
a. Aliments contaminés	1	2	9
b. Eau de boisson contaminée	1	2	9
c. Dentition	1	2	9
d. Choses sales dans la bouche	1	2	9
e. Infection (microbes)	1	2	9
f. Mère ayant mains sales	1	2	9
g. Enfant ayant mains sales	1	2	9
h. Malnutrition	1	2	9
i. Mouches	1	2	9
j. Mauvais Esprits	1	2	9

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

39. Croyez-vous qu'on peut prévenir la diarrhée des enfants de moins de 5 ans? O N
Si OUI, par quels moyens? _____

Maintenant je vais vous lire quelques possibilités pour prévenir la diarrhée chez les enfants de moins de 5 ans et pour chaque article dites-moi si vous le croyez être un moyen important ou pas important.
(Lire chaque article à haute voix et encercler le code de la réponse)

Article	Important	Pas Important	NSP
a. Garder la maison propre	1	2	9
b. Faire bouillir l'eau de boisson	1	2	9
c. Laver les mains de l'enfant	1	2	9
d. Laver les fruits et legumes	1	2	9
e. Surveiller le manger des enfants	1	2	9
f. Laver vos mains avec eau et savon			
1. Avant de faire la cuisine	1	2	9
2. Après avoir changé les couches sales	1	2	9
g. Laver les ustensiles de cuisine	1	2	9
h. Allaitement maternel de bébé	1	2	9
i. Rechauffage des restes d'un repas	1	2	9
j. Dépôt de la matière fécale dans la toilette	1	2	9

40. La dernière fois que vous avez nettoyé votre enfant (un de vos enfants) après défécation avec quoi avez-vous nettoyé vos mains? (Ne suggérer pas – Mais encourager) (Encercler une seule réponse)

a. Essuyé avec un chiffon 1
b. Lavé avec de l'eau seulement 2
c. Lavé avec de l'eau et du savon 3
d. Autres 4 A Préciser _____

41. Où votre enfant a-t-il déféqué la dernière fois? (Encercler la réponse donnée)
(Ne suggérer pas)

a. Dans une couche 1
b. Dans le pot 2
c. Au toilette 3
d. Par terre 4
e. Dans la rue 5
f. Ne sait pas 6
g. Autre 7 A Préciser _____

42. Où ont été jetées ces selles? (Encercler la réponse donnée)
(Ne suggérer pas)

a. Dans les toilettes 1
b. Dans la poubelle 2
c. Jetées hors de la maison 3
d. Enterrées 4
e. Ne sait pas 5
f. Autre 6 A Préciser _____

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

VI. SOURCE D'EAU POUR LE MENAGE

43. Quelle est la source principale de l'eau pour les membres de votre famille? (Encercler la réponse donnée)

(On peut suggérer)

a. Eau courante (Robinet)		
1. Branchée à la maison	1	Aller à Q45
2. En dehors de la maison	2	Aller à Q44
b. Puits	Protégé	Non protégé
1. Communautaire	3 Aller à Q44	4 Aller à Q44
2. Privé (dans la cour)	5 Aller à Q45	6 Aller à Q45
d. Colporteur	7 Aller à Q44	
e. Autre	8 Aller à Q44	A Préciser _____

44. Si la source est en dehors de la maison, la distance est-elle à moins de 200 mètres? O N NSP

45. Cette source d'eau est-elle disponible 24 heures sur 24 (jour et nuit)? O N NSP

46. Cette source d'eau est-elle disponible pendant toute l'année? O N NSP
Si NON, pour quelle raison? _____

47. Payez-vous pour cette eau? O N NSP
(Si la source s'agit de l'eau courante [Q43=1 ou 2] aller à Q51)

48. Si l'eau vient d'une source autre que l'eau courante (robinet), demander:
Acceptériez-vous de payer un branchement dans la maison ? O N NSP

49. (Votre eau est-elle traitée? O N NSP
(Si NON ou NSP, aller à Q51)

50. Quel produit est utilisé pour le traitement, si ce n'est de l'eau courante?
(Cocher la réponse donnée)

a. Eau de Javel	1	
b. Ne sait pas	2	
c. Autre produit	3	A Préciser _____

VII. CONSERVATION DE L'EAU DE BOISSON

51. Comment conservez-vous de l'eau de boisson? (Cocher les réponses données)

a. Seau	☐	b. Jarre	☐
c. Bidons	☐	d. Bouteille	☐
e. Fût	☐	f. Citerne	☐
g. Dans le réfrigérateur	☐	h. L'eau n'est pas conservée	☐
i. Autre	☐	A Préciser _____	

S'il s'agit d'un récipient à large ouverture, aller à Q52, si NON aller à Q53

52. A l'aide de quoi vous servez-vous de l'eau de ce récipient pour boire? (Encercler la réponse)

a. Ustensile réservé spécialement pour l'eau	1	
b. N'importe quel ustensile	2	
c. Avec les mains	3	
d. Avec un robinet	4	
e. En versant de l'eau	5	
f. Autre	6	A Préciser _____

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

VIII. TOILETTES / LATRINE

53. Quel type de toilette est utilisé par votre famille? (On peut suggérer) - (Cocher une réponse)

a. Adultes

1. Toilette turque	1	
2. Toilette romaine (avec siège)	2	
3. Toilette turque et romaine	3	
4. Toilette avec trou seulement	4	
5. Dans la nature	5	
6. Autre	6	A Préciser _____

b. Enfants de moins de 5 ans (On peut suggérer) - (Cocher une réponse)

1. Toilette turque	1	
2. Toilette romaine (avec siège)	2	
3. Toilette turque et romaine	3	
4. Toilette avec trou seulement	4	
5. Pot	5	
6. Dans la nature	6	
7. Autre	7	A Préciser _____

IX. ASSAINISSEMENT

54. Avez-vous un service de ramassage d'ordures? O N NSP

a. Si OUI, payez-vous pour ce service? O N NSP

b. Si NON, acceptériez-vous de payer pour un tel service? O N NSP

(S'il n'y a pas de service de ramassage d'ordures, aller à Q56)

55. Depuis combien de jours ce service est-il venu collecter les ordures? (Encercler la réponse)

a. Chaque jour	1
b. Moins de 3 jours	2
c. Il y a une semaine	3
d. Il y a plus d'une semaine	4
e. Ne sait pas	5

56. Quel est votre système d'évacuation des eaux usées? (Encercler une réponse)

a. Réseau d'égouts	1	
b. Puits perdu	2	
c. Fosse septique	3	
d. Dans la rue	4	
e. Autre	5	A Préciser: _____

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

X. OBSERVATIONS PAR L'ENQUETRICE DE LA MAISON / COUR

Maintenant si vous me permettez, je voudrai visiter votre maison.

A. PROPRETE DE LA MAISON (ENCERCLER LES REPONSES CORRECTES)

57. OBSERVATION	**INTERIEURE**	**EXTERIEURE**
a. Ordures		
1. Par terre	O N	O N
2. Y a-t-il un récipient à ordures?	O N	O N
3. Est-il couvert?	O N NP	O N NP
b. Matière fécale par terre		
1. Humaine	O N	O N
2. Animale	O N	O N

B. CUISINE / LIEU DE PREPARATION DES REPAS

58. Mouches (Encercler un chiffre)
- a. Pas de mouches 1
- b. Quelques mouches 2
- c. Beaucoup de mouches 3

59. Y a-t-il de la nourriture prête à consommer non couverte? O N NSP

60. Y a-t-il un réfrigérateur qui fonctionne? (Questionner, si nécessaire) O N

61. Quelles sont les principales sources d'énergie utilisées pour faire la cuisine? (Questionner si nécessaire)

(Cocher toutes les réponses)
- a. Bois / charbon ☐
- b. Butagaz ☐
- c. Electricité ☐
- d. Autre ☐ A Préciser: _____

B. SOURCE PRINCIPALE D'EAU

62. Etat des robinets
- a. Combien de robinets avez-vous vu? ____ (Si néant, aller à Q63)
- b. Il y a-t-il de l'eau (pression adéquate)? O N
- c. Les alentours de tous les robinets sont-ils sales? O N

63. Combien de puits avez-vous vu? _____ (Si néant, aller à Q64)
- a. Il y a-t-il une margelle? O N
- b. Le puits est-il couvert? O N
- c. Autour du puits, y a-t-il < 1 pas < 5 pas
  - 1. Ordures O N O N
  - 2. Eaux usées O N O N
  - 3. Matière fécale (Humaine et/ou animale) O N O N

C. CONSERVATION DE L'EAU A BOIRE

64. Récipients de conservation de l'eau de boisson (Cochez les observations)
- a. Tous totalement couverts ☐
- b. Certains ne sont pas couverts ☐
- c. L'eau de boisson conservée dans le réfrigérateur ☐
- d. L'eau de boisson pas conservée ☐
- e. Autre ☐ A Préciser _____

Numéro D'Identification du Questionnaire **__ __ __ __ / __ __ __ __ (Quartier / Maison)**

D. EAUX USEES

65. Où les eaux usées sont-elles jetées? (Encercler les réponses correctes)

a. Fosse septique / puits perdu	O N
b. Egout	O N
c. Dans la rue par le maison enquêtée	O N
d. Dans la rue par les maisons voisines	O N
e. Par terre dans la cour	O N
f. Autre	O N

E. TOILETTE / LATRINE

66. Observations (Encercler une réponse par question)

a. Fonctionnelle (pas d'obstacle) O N
b. Signes d'utilisation (eau, savon, etc.) O N
c. Matière fécale
(Par terre, sur le siège, sur les murs) O N

F. DEMONSTRATION DE LAVAGE DES MAINS

67. Y a-t-il un endroit spécifique (système) désigné pour le lavage des mains? O N
(L'endroit où on se lave les mains le plus fréquemment)

Si OUI, où se trouve-t-il? _____
Si OUI, y a-t-il: de l'eau? O N
du savon? O N
Où est déversée l'eau usagé? A préciser: _____

68. QUESTION: Lorsque vous vous sentez que vos mains sont sales, comment vous les laver?

La femme accepte-elle de faire la démonstration? O N
Si elle n'accepte pas de se laver les mains devant vous, aller à Q69

OBSERVATION (Encercler un chiffre)

a. Se sert de l'eau seulement 1
b. Se sert de l'éau et du savon / détergent 2
c. Se sert de l'eau et des cendres 3
d. Autre 4 A Préciser _____
(Encercler une réponse par question)
e. Se lave les deux mains O N
f. Se frotte les mains au moins 3 fois O N
g. Sèche les mains dans l'air O N
h. Sèche les mains avec un tissu propre O N

FIN

69. Indiquez l 'heure de la fin de l'interview Heure __ __ /__ __ (HH/MN)

N'oubliez pas de remercier la personne interviewée pour avoir répondu a vos questions et demandez lui si elle / il a des questions à vous poser?

Relisez le questionnaire avant de le rendre au superviseur afin de corriger les erreurs et remplir les omissions

Appendix B: Schedule of Activities in Baseline Study

The following summarizes the major activities from July 19 - August 20, 1999.

Date	ACTIVITIES
19-20/07/99	Planning meetings with EHP and USAID in Arlington - Pat Kelly
21/07/99	Agadir: First planning meeting of co-investigators
22/07/99	Agadir: Internet installation / car and computer rental / visit health delegations at Agadir and Ouled Teima
23/07/99	Agadir(: Meeting with Dr. Ferhaoui and Mr. Tahar of USAID Morocco at the health delegation
23/07/99	Taroudent: Meeting with health delegation/presentation of study and exploration of participation possibilities
24/07/99	Agadir: Questionnaire revision / review of Phase II dossier
25/07/99	Preparation of sampling plan and general organization of the study
26/07/99	Ouled Teima: Meeting with municipal leaders, the health center team, and Phase II interviewers
26/07/99	Drarga: Meeting with the president of the commune and census agents
27/07/99	Ouled Teima: Interviewer training for personnel from Ouled Teima and Taroudent, and discussion of questionnaire
28/07/99	Ouled Teima: Revision, translation, and test of questionnaire at Chrarda with interviewers from O. Teima and Taroudent
29/07/99	Agadir: Training preparation/ interview and selection of interviewers and supervisors / Angela Scafino from USAID
30/07/99	Ouled Teima: Interviewer training for Taroudent, Agadir, and O. Teima/ Angela Scafino present / Survey methods and random sampling explained to team
31/07/99	Ouled Teima: Training / complete survey test at Chrarda / Angela Scafino present
01/08/99	Ouled Teima: Sampling/ final preparation of questionnaires, localization of contact points/orientation of guides
02/08/99	Ouled Teima: Organization of survey teams, study begins at Zaouet Sidi Borg / begin data entry with Epi Info
03/08/99	Ouled Teima: Study at Zaouet Sidi Borg and Chninette / verification of census at Boukhris and Cité M'barka
04/08/99	Ouled Teima: Study at Chninette and Boukhris
05/08/99	Ouled Teima: Study at Cité M'barka and Chninette / verification of household lists of Boukhris and Ouled Fhal
06/08/99	Ouled Teima: Study at Chninette, Cité M'Barka, and Ouled Fhal / verification of census lists of El Glita
06/08/99	Drarga: Contact census agents / planning study organization / verification of household lists
07/08/99	Ouled Teima: Study at Chninette, Cité M'barka and El Glita/ end of data collection at Ouled Teima
08/08/99	Agadir/Drarga: Logistics preparation / sampling / revision of household census lists
09/08/99	Drarga: Study at Teghza and Drarga Bas
10/08/99	Drarga: Study at Iguidar and Drarga Bas
11/08/99	Drarga: Study at Ikiou and Ikou Khrib
12/08/99	Drarga: Study at Maassar and Ikiou
13/08/99	Taroudent: Day of synthesis/evaluation of study with interviewers and supervisors / end of survey
14/08/99	Agadir: Data entry completed / verification, indicator definitions, preparation of meetings with stakeholders
15/08/99	Agadir: Epi Info training session / observation visit and group interviews to further study risk factors
16/08/99	Agadir: Data verification and cleaning / descriptive data analysis, discussion of results with acting health officials
17/08/99	Drarga: Discussion of preliminary results with health and municipal officials in Drarga
17/08/99	Ouled Teima: Discussion of preliminary results with health and municipal officials of O. Teima and Taroudent
18/08/99	Agadir: Questionnaire storage at Drarga / copies of data given to health delegations at Agadir / Taroudent / trip to Rabat

19/08/99	Rabat: Preparation of preliminary report / debriefing with USAID team
20/08/99	Return of co-investigators to Tunisia and the USA