Women, Water, And Sanitation: Household Behavioral Patterns In Two Egyptian Villages

by Samiha El Katsha
Social Research Center
American University in Cairo
113 Kasr el Aini
Egypt
*and Anne U. White**
Institute of Behavioral Science
Box 482, University of Colorado
Boulder, CO 80309, U.S.A.

ABSTRACT

Understanding the behavior patterns of women in rural households regarding water and sanitation may be the key to solving the problem of why improvements in facilities may not be accompanied by a reduction in disease prevalence. An interdisciplinary team surveyed 312 households in two Egyptian delta villages, examining 46 of them in depth, with participant observation. Their patterns of storing water, and its use for drinking, cooking, washing, animal rearing and waste disposal are rooted in the woman's beliefs regarding cleanliness and what enhances the health and well-being of her family. The local environment of surface and groundwater availability, quality and available drainage affect her choices. Other factors include local government institutions, available technology, information and educational facilities, time and energy expended on various practices, and social values held by the women and the community. The women suggest practical solutions for their water and sanitation problems such as carts for collecting waste water, but feel powerless to influence local governments, or even their husbands, to institute new practices. Such targeted studies can disclose linkages among significant factors in the household environment, and should be undertaken for any project designed to provide effective and lasting water and sanitation in rural villages.

Understanding of the behavioral patterns of women in their households may be a key.

INTRODUCTION

Understanding of the behavioral patterns of women in their households may be a key to solving the problem of why community water supply and sanitation improvements are not necessarily accompanied by reductions in disease prevalence (as examples: [1, 2]). This view is supported by a recent investigation in two Egyptian villages.

Much of the activity under the International Drinking Water Supply and Sanitation Decade (1980-90) presumes that provision of safe and adequate water supplies, and safe systems for disposal of human waste is essential for good health and a contribution to improved quality of life [3]. The effects, however, are not certainly of large benefit to health, and it is important to know why that is so in specific areas.

In Egypt, for example, the first developing country to extend potable water supplies to all its rural population [4], and possessing more doctors, nurses, and clinics than many lower middle-income countries, the infant mortality rate remains as high as that of countries with much less infrastructure, with diarrheal diseases reported as a major cause of death. It has been reduced in recent years, but it is estimated at 88 deaths per 1,000 in 1986 [5]. It is also known that prevalence of schistosomiasis has declined in sample Egyptian villages, and that this may be ascribed in part to water hydrants eliminating the need to wade in canals [6].

* Anne U. White died on April 10, 1989

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Much useful work has been performed during the Decade regarding the components of health-related behavior regarding water and sanitation. Examples are the comprehensive studies of water related diseases and the range of technological possibilities done by the World Bank. Other studies have looked at the cost-effectiveness of individual measures such as hand washing [7].

Research on the role of women [8], or the growing understanding about the realities and possibilities of community participation [9] have slowly broadened understanding. Just recently a discussion paper for the World Bank acknowledged that the time of rural women in developing countries does have an economic value, albeit a small one, that must be factored into cost-effective calculations for water and sanitation improvements [10]. But some of the questions asked nearly 20 years ago [11] still have not had in many areas a more precise answer than to recognize that physical improvements may not be sufficient. Why do people not use facilities such as a hydrant or standpipe when it delivers purer water, or not use a pit latrine when available? Why does new and valid information about health hazards and safe practices not result in reduced mortality or disease morbidity? The challenge is to find answers, and put them together in a way that makes prevention of disease a reality in the household.

An interdisciplinary team in Egypt in consultation with a larger task force recently addressed this set of problems [12]. It set out to 1) determine the pattern of women's behavior related to the handling and utilization of water and waste, 2) identify some linkages between behavioral patterns and the transmission of diseases, and 3) seek an understanding of the cultural framework and household economy within which the patterns fit.

The underlying assumption was that the woman in the household is the determining influence.

The underlying assumption was that the woman in the household is the determining influence on the health-related behavior of the other members. Her roles of manager of the household use of water and sanitation and other facilities, acceptor or rejecter of new technology, and agent of behavioral change [13], are considered to be of primary importance in any attempts to improve community health and well-being.

The task force participants were administrators, scientists, and technicians from a wide range of training and skills. They included anthropologists, economists, bacteriologists, communications experts, demographers, directors of community and national programs, engineers, geographers, health educators, parasitologists, physicians, public health specialists, social workers, and sociologists. The authors of the final report are two anthropologists and two physicians all concerned with environmental health.

THE STUDY AREA

The survey sample (312 households), 25% of the total number, was drawn from two agriculturally oriented villages, both Menoufia governate, Kafr Shanawan (hereinafter referred to as K) in Markaz Shebeen El Kom and Babil (hereinafter referred to as B) in Markaz Tala (see Fig. 1). Of these households, 46 took part in an intensive observation and in-depth examination of behavioral patterns related to health, and an environmental assessment including water and stool sampling. These village households are considered representative of many in the Nile delta where about two-fifths of the Egyptian population live. They illustrate a considerable range in household facilities but are similar in the range of socioeconomic status.

Table 1. Percentage Facilities in Two House Types in 312 Households

Characteristics	Adobe (137)		Red Brick (175)
Piped water	21	⟷	71
Latrine	86	⟷	95
Dust floor	85		55
Separate kitchen	13		60
Animal raising	88		27
Electricity	98		99

Table 2. Environmental Conditions Within 46 Households

	Number of Households			
	Babil		Kafr Sanawan	
Index				
Crowding index				
Less than 2	14		10	
2-4	8		11	
4-6	1		2	
Ventilation index				
	Adobe	Red Brick	Adobe	Red Brick
Good	6	8	4	12
Fair	5	1	2	2
Poor	3	-	-	3
Fly index				
Less than 110	3		3	
110-43	20		20	

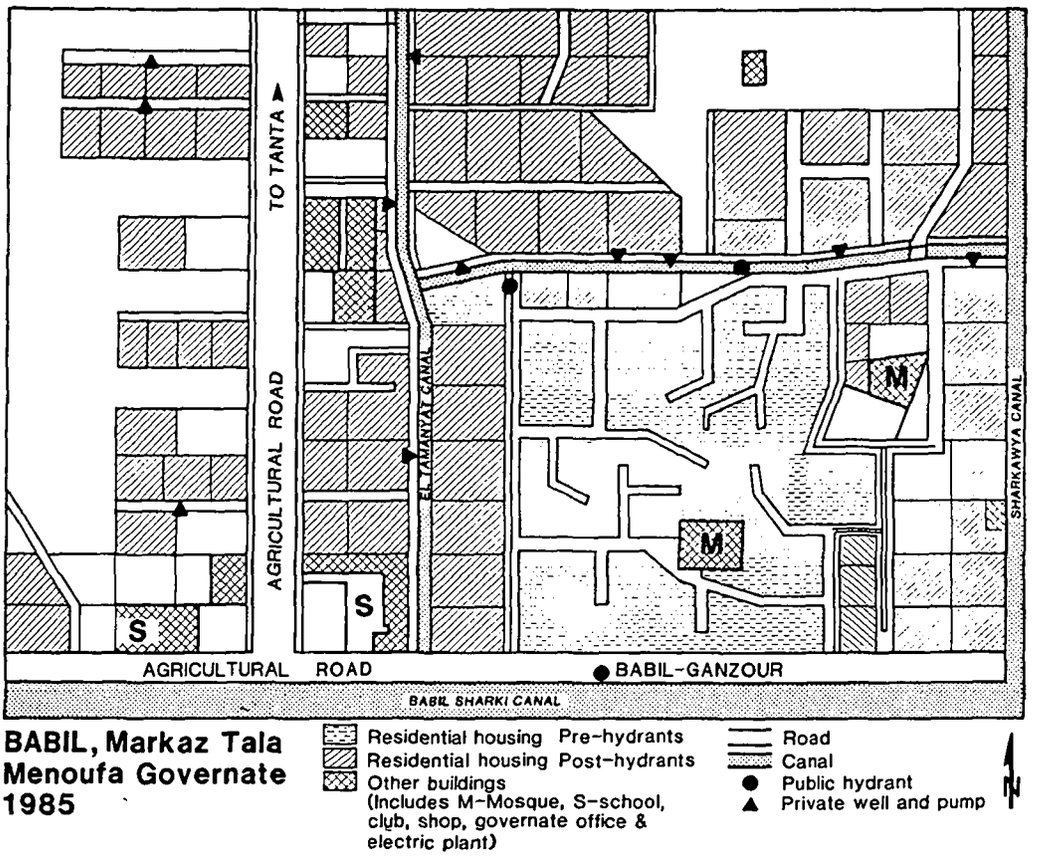

Figure 1. Map of Babil village. Major land uses in 1985. The residential uses are in two stages, those built before the public standpipes were installed, and those constructed thereafter. Each housing unit typically consists of an enclosed courtyard, including a visitor's room, a storage room, an oven, a latrine, one or two bedrooms, a room (*zereeba*) for livestock, and a place for piped water, if installed, either inside or outside the entrance door. Stairs lead to the roof that is used for poultry raising, and storing dung and straw.

Laboratory examination was made of water supply in each of two periods (April-May and July) for six parameters of chemical water quality, and for occurrence of total bacteria, and faecal coliforms. Stool tests for parasites were made of children and females in the 46 observation households. The survey solicited reported diseases for all members of the 312 households. For the observation households, three indices believed to have relevance to disease transmission were computed: a crowding index was the number of people per sleeping room; a ventilation index was the ratio between areas of floor space and area of openings for sleeping rooms; a fly index was the number of flies observed on a square meter of the floor at designated places and times (see Table 2)

Among these observation households, ten were investigated in greater depth by 24-hour observation of activities of individual family members.

WATER SUPPLY AND SANITATION

A piped water supply from deep wells was introduced in B in 1965, but the output per 12-hour period amounts to only about 31% of the estimated daily consumption, and the flow is irregular. Three heavily-used public standpipes, occasionally polluted, shallow, hand-pumped wells, and the canals constitute the remaining sources for the village.

K was supplied with piped water in 1952, also from deep wells, but with recent renovations has an abundant and regular supply. Most people are connected to the piped water supply, and the one public standpipe is used infrequently.

Two house types prevail in the villages; one is the traditional adobe, subject to damage from rising groundwater, the other is a more recent design made of water-resistant red brick. In 1965 groundwater damage affected the adobe houses in K, with the result that 76% of the houses there are now red brick, as contrasted with only 24% of those in B, the rest being the traditional type (see Table 1).

In both villages ground water is less than 1 meter below ground level, and has a higher content of dissolved solids and chlorides than surface water.

There are no central sewerage or waste-water systems. In B, a water tap next to the door is the predominant pattern, with no drainage facilities. Waste water is emptied into the street, or, if the neighbors in nearby adobe houses object, taken to the canals. Most of the houses in both villages have pit latrines with no drain, or, less frequently, are connected

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to barrels or a rudimentary septic tank, both requiring frequent emptying.

The two villages have populations with very similar socio-economic characteristics. In terms of persons per household (B 7.7 and K 7.0); proportion of nuclear families (67% and 63%); availability of electricity (99% and 97%); proportions with television sets (83% and 87%), washing machines (64% and 59%), refrigerators (16% and 21%); latrines in household (86% and 97%); and illiteracy of females (75% and 73%), they were much alike. They differ notably in percentage of households having a piped water connection (B 17% and K 82%), and separate animal accommodations in courtyards (71% and 35%). In both villages the households in adobe buildings and those in red brick buildings with wooden or concrete roofs differed in several major dimensions found to have an association with health-related activities.

The chemical analysis showed that in both villages the water delivered in the public supplies had a hardness ranging from 300 to 530 mg/l in contrast to 100 to 480 in the adjacent canals. Dissolved solids were 435-633 mg/l in the pipes compared to 213-665 in the canals (see Table 3). Much of the variation can be linked to conditions of canal flow and irrigation.

The differences in bacterial quality were more pronounced according to season and discharges into ground and surface waters (see Table 4). The canals at washing sites showed total bacterial counts between 10,000 and 115,000 per ml. In the standpipes these ranged between 30 and 580 per ml. No faecal coliforms were found in the K supply, but the B reports showed 0 to 7, and in the canals they fluctuated between 115 and 11,175. In hand pumps in B the faecal coliform count was 33 to 45.

Table 3. Chemical and Bacteriological Quality of Water Sources
Spring and Summer, 1985
Babil and Kafr Shanawan

	Ground Water						Surface Water	
	Public Tank (on leaving tank)		Standpipe		Hand Pump		Canal (upstream from washing site)	
	B	K	B	K	B	K	B	K
Chemical mg/l								
Dissolved solids	625-644	480-535	633-681	435-555	631-707	441-484	227-264	302-213
Sulfate	35-34	18-72	32-42	28-76	45-22	28-16	10-22	7-41
Total hardness	360-560	300-480	357-530	300-450	340-492	267-500	80-263	135-313
Chloride	135-120	90-150	128-122	95-95	135-153	107-115	35-32	79-58
Nitrate	.04-.52	.08-.6	.05-.17	.12-.12	.36-.04	.12-1.0	.03-.07	.12-1.3
Turbidity: units	4.7-6	7-9	6.2-5.7	7-10	2-6.3	17.3-30	23-18.7	12.5-17.5
Bacteriological:								
Total bacterial count ml	19,090-1,000	44-10	5,000-629	580-30	125-155	222-300	39,837-148,600	2,670-97,926
Faecal coliforms	0-0	18-0	7-0	0-0	45-33	0-0	115-8,523	156-11,175

Table 4. Bacteriological Analysis of Water Sources from 46 Households in Babil and Kafr Shanawan

	B (March, 1985)		K (April, 1985)	
	Tap water	Stored water	Tap water	Stored water
Total bacterial count per ml	229,408	597,100	41,629	89,700
Faecal coliforms per 100 ml	14	1,094	1	877

BEHAVIOR PATTERNS

The study examined the patterns of water use for drinking, cooking, laundering, washing, animal rearing, and waste disposal in terms of where the water is obtained, how it is transported to and used within the household, and how it leaves the household. In each pattern an effort was made to identify the principal considerations that appear to influence the women in deciding what to do in their local circumstances. Seven major sets of factors were taken into account: a) the local environment of surface and ground water availability and quality, and available drainage; b) the local organization and institutions for dealing with water; c) available technology, such as pumps and washing machines; d) information and educational facilities to which the villagers have access; e) the time and energy expended on various practices; f) social values held by the women and men of the community; and g) perceived health effects as measured by reported mortality and prevalence of disease.

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CLOTHES LAUNDERING

The mode of analysis is illustrated by examination of the practice of laundering clothes. In the observation sample, 43% of the households in B and 87% in K choose to take their clothes to the canal to wash, even though 32% of them have a water tap connected to the village supply. Their reasons are complex but discernable. The canal water lathers more readily and yields whiter clothes than the ground water pumped in the village pipes (total dissolved solids are an average of 681 mg/l for the reservoirs in B, 681 for the piped supply, and 236 for the canals. The shallow wells are even higher-707 mg/l. In K the difference is slightly less extreme. Given the limited capacity of the latrines, septic tanks where they exist, and other sullage facilities, the disposal of waste water in the latrines, septic systems or the street carries the hazard of weakening the foundations of adobe houses and pooling water in areas adjoining both adobe and brick houses with subsequent complaints from neighbors. Although possessed by over 60% of the households, washing machines are largely a status symbol. While many respondents claimed to wash at home, in-depth interviewing and observation revealed contrary results. (To this and similar questions, most women initially tended to give what they believed to be expected answers instead of the actual practice.) Water quality, cost, and the difficulty of sullage disposal are

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important factors. The women know that washing in the canal has a risk of exposure to bilharziasis but feel there is no viable alternative when they take into account the time and energy of carrying waste water back to the canal, the high premium placed by women and men alike on very white clothes, the objections by neighbors to dumping water in the street, and value attached to water quality.

All of these considerations enter into the choices made by the women who carried their wash to the canal, and carry it back to be possibly machine washed, boiled and sun-dried in the household. These choices might be altered by changes in drainage, in waste collection, in standards of clothing appearance, or in information about health hazards of the canal.

A similar analysis is applied to other activities involving water. Without attempting a presentation of all of them, a few of the findings are summarized here to indicate their scope and also to suggest conclusions of a more general character.

FETCHING DRINKING WATER

In both villages, drinking water receives the best care possible in respect to source, fetching, and storage. With a few exceptions, the women believe that the water must be clear and free of odor, and they are concerned about taste as indices of quality. The tasks of fetching and storing it are usually delegated to the cleanest and most energetic women within the household, and in an extended family, the mother-in-law delegates the most appropriate candidate, regardless of status. Commonly an adult female or sibling over 14 years is designated, and spends 20-30 minutes per load, one or more times a day, using clay, metal, or plastic containers. In households with piped connections drinking water is drawn from the tap. In the other half of the households it is carried from public hydrants or private hand pumps, the exceptions being mostly elderly women who go to the canal because they believe it quenches their thirst better.

Those going to public hydrants have complaints because of waiting time to fill their containers, low water pressure at certain hours, the time required to clean the container before filling it, and irregular periods of supply. They try to minimize contamination by washing the container with soap and rice hay, and by avoiding contact with waste water. Thus, until the water is available in the house, generally effective measures are taken to maintain its relative purity.

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STORING DRINKING WATER

Once drawn, water generally is kept in one of four types of containers, the first three being used for cooling: the *oullah*, a traditional narrow-necked clay jug holding one to two liters; glass or plastic bottles; the *zir*, another traditional porous clay container holding 20 or more liters; and aluminum storage containers with either a fitted cover or a tap. Care is taken to cover all open tops to keep out dust (see Fig. 2). The family drinks directly out of the oullah and bottle, but must dip into the zir or open-topped storage container with cups that rarely are washed.

Laboratory examination of water sampled at the source and in the various containers reveals major differences in quality. The women, however, consider all of their practices to be free from danger of disease transmission.

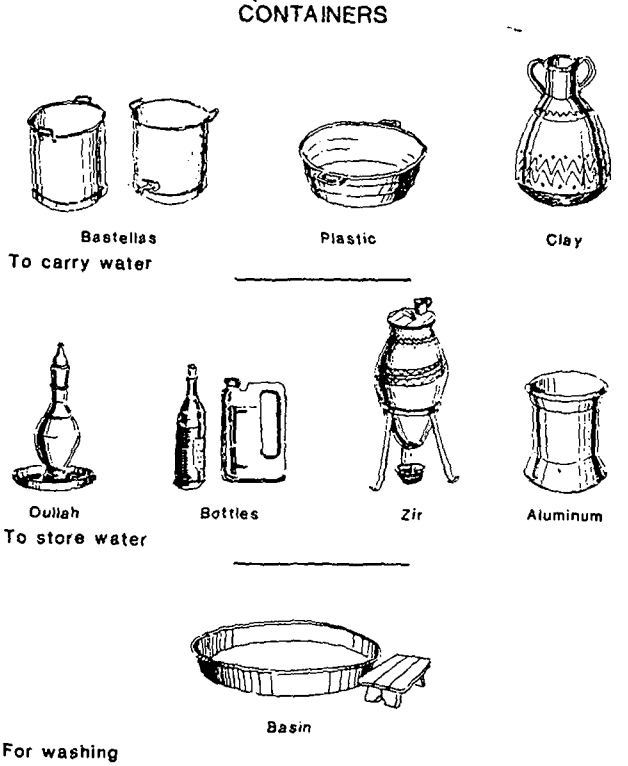

Figure 2. Containers for transporting water and storing water in village households.

EXCRETING

Latrines are present in all but 8% of the houses, red brick and adobe alike. Those in the red brick houses, however, are better constructed and somewhat better maintained. The latrines are used mostly by the females, with a few using the roofs, whereas the males frequently use the mosques when not in the field. A tin of water is usually placed near the latrine for rinsing after defecation. Most pre-school children of both sexes are not trained to use the latrines; they generally defecate in the street.

The prevalent type of latrine is a hand-dug hole lined with red brick and covered with a concrete slab. Drainage is into the surrounding earth and groundwater. These latrines are cheap, practical, and the contents can be used as manure, but they are odorous, collect flies, and threaten groundwater contamination.

Among all household facilities, latrines have the lowest priority for upkeep and cleanliness. This appears to be related to the predominantly dirt floors, lack of drainage and the concern about the water affecting the adobe walls, as well as the expense of emptying the pits or cess-pools, all of which inhibits the use of water for cleaning. There is no evidence that the women regard the latrine areas as health hazards.

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BATHING AND HAND WASHING

Since the inhabitants of the villages are largely Moslem, they follow the Islamic teachings regarding purification before prayer. Women wash hands, face, mouth, ears and feet daily before prayers, and take a complete bath after sexual intercourse, menstruation, and childbirth. The use of soap is not required. General baths are taken once or twice a week, using soap and a loofah (gourd sponge).

The women state that washing with soap is essential 1) after handling things with strong odors--i.e. fish, kerosene, or cow dung for fuel cakes, 2) before baking or dairy chores, 3) after defecation, and 4) after eating greasy food. But during the intensive study of 10 cases, little hand washing was observed, and little use of soap.

Hands are not washed on a regular basis before cooking, eating, nursing infants, nor after changing an infant who has defecated.

DOMESTIC ANIMALS

Water usage for animals, usually cattle and poultry, is limited to animal watering, and the cleaning of utensils used for feed. Cleaning of the *zereeba*, the room where the animals are kept, takes priority over other tasks, and is performed usually by a responsible older woman. She is also in charge of accumulating the dung for fuel cakes prepared by hand on the dirt floor and stored when dry for sale or for use in cooking.

FOOD HANDLING

Cooking is done once a day, and baking once a week. Women use water sparingly in cooking, often reusing vegetable wash water to wash a dirty cup or utensil. Where more abundant water is required, as for washing lettuce, they use the canal. The eating of raw vegetables without washing, the use of canal water, the lack of hand washing with soap before food preparation or after handling dung cakes, coupled with the room temperature storage of left-over foods, all provide routes for faecal-oral and other disease transmission.

INFORMATION AND EDUCATION

Although the two villages are blanketed by television and radio, and have access to public health units and social centers in addition to the regular primary school system, many of the women do not perceive the role of water in hindering or fostering disease transmission. The household surveys show them to be deeply concerned with maintaining the health of their families. They go to great pains to wash out the water containers and to protect them from dust. They generally know that schistosomiasis may be contracted by body contact with canal water. Yet, they permit a child fresh from defecating to dip its hand into a carefully covered *zir*, they stand in the canal while laundering, and they do not wash their hands before preparing food.

Many of the women do not perceive the role of water in hindering or fostering disease transmission.

Much of this behavior may be traced to misinformation or misunderstanding. By and large, they believe that once water is obtained from a pipe it will remain pure regardless of further modes of use. Hence, the slight regard for human contact in the *zir* in contrast to meticulous effort to clean that container periodically.

They also believe that naturally running water is not harmful to health in contrast to standing water. The majority regard schistosomiasis as a real danger that can be contracted only by swimming in the canal and swallowing water while swimming. Hence, their willingness to wade in the canal while laundering when there is no satisfactory alternative, or to permit others to do so.

The women seek to avoid the pooling of water in the street but they feel no urgency to clean the household latrine or to curb defecation by children on the street or interior dirt floors. They pay careful attention to the feeding of cattle and cleaning of the courtyard stalls.

Given the fragmentary understanding they have of disease transmission, their behavior is not unreasonable. And it is not likely to change simply by adding to the already adequate quantity of water or by installing a tap in every household. If that understanding is to be improved, the channels of education--schools, television and radio, health center programs, community discussion--will have to be used to add to or correct the current information and motivation. Finding the effective message and communication channel may not be easy.

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In the 46 observation households the major reported cause of death from all causes for children under 10 years of age was gastrointestinal (55% in B, 44% in K). A measles epidemic took a heavy toll in K (7 deaths out of the total of 25), and two deaths of 29 in B. Respiratory disease accounted for 20% of the child deaths in K, and congenital anomalies for 20% of those in B.

For the total population of the 46 households, gastrointestinal complaints were most numerous (39.3% in B and 35.0% in K), eye complaints next most common (31.8% and 30.9%), respiratory disease running 7.5% and 5.4%, other fevers 4.8% and 6.3%, with all others amounting to 16.6% and 22.4%. The examination of stool samples indicated positive cases for parasitic diseases as shown in Table 5.

Comparing these with several indicators of conditions in the reporting households, it was found that there was a strong association between crowding and respiratory disease prevalence (see Table 2). The minority of families without a separate room for animals report a higher rate of respiratory and gastrointestinal disease. In both villages there is a rough association between the crowding index and prevalence of disease. Likewise, there is an association between quality of ventilation and mortality due to respiratory disease and measles among children of less than 10 years in age. The same applies to the fly index. The prevalence of disease also is high where the fly index is high and low where it is low. The provision of private solid waste containers is associated with a higher fly index in the streets outside the B houses, while there is no association for the K streets.

Table 5. Incidence of Parasitic Disease from Stool Examination

Survey of 46 Households

Percentage of Positive Cases Among Total Number Examined

	School Children		All Other Members	
	Babil	Kafr Shanawan	Babi	Kafr Shanawan
Bilharziasis (Schistosomiasis)	2.9	10.6	7.4	7.7
Oxyuris	1.5	0.7	-	-
Ascaris	3.5	0.6	7.4	15.4
Trichuris	-	0.2	-	-
Ancylostoma	-	0.4	-	-
Amoebiasis	-	-	11.1	15.4
Trichostrongloides	-	-	-	3.8

WOMEN'S AWARENESS OF HEALTH PROBLEMS

The majority of the women surveyed are aware of, and have stated their dissatisfaction with the existing sanitary conditions in their immediate environment. They have suggested feasible solutions to some of their problems, such as communal septic tanks or a cart collection of waste water, solid waste collection with regular service, or the use of educated elderly women to communicate health-related information within their neighborhood. However, the main constraint for community participation appears to be their feeling of powerlessness, that responsible bodies would never listen to their complaints or suggestions, as such action is beyond the women's domain.

The main constraint for community participation appears to be their feeling of powerlessness.

A second phase of the study under the auspices of the International Development Research Center in Canada, is attempting to identify problems in the institutional management of water supply and sanitation, and to find ways of enhancing the capacity of the women particularly, as well as the whole community, to solve these problems. It is aimed at mobilizing the local level service and community workers to actively assist the villagers in improving village sanitary facilities, working through various levels of government, as well as initiating viable water and sanitation educational programs.

One lesson from this study has relevance in many other situations where village water supply and sanitation improvements are planned or completed. As Briscoe and de Feranti put it, "The hardware components of water projects are only one link in a long chain. The other links involve changing hygiene habits and other factors and can require actions ranging from providing better education to promoting public health programs. If any one link is missing, health indicators may not improve. But this does not mean that investing in individual links is futile. Where it is not possible to upgrade all links simultaneously, one must take a longer view, proceed step by step, and not expect to see large health improvements until the last step has been completed" [9]. To identify these individual links in a given community, the design and management of physical facilities should be accompanied by actions based on a study of the prevailing behavior patterns and their components. Without analyzing household behaviors and the factors affecting them, and bringing the community into the planning process, it is hazardous to initiate improvements in community information and facilities with the expectation that any change will decrease disease transmission.

It is conventional wisdom that water supply and sanitation measures do not necessarily contribute to the enhancement of human health in villages. It is also recognized that programs of health education relating to water and waste do not necessarily result in reduced disease prevalence. What is not yet conventional wisdom is that there are common sense methods of finding out why this is and of identifying possible means to correct them. A reasonable component of total funds for the project must be directed to this end. The recent Egyptian study demonstrates the opportunity.

Such inquiry need not be highly expensive by comparison with the cost of designing physical improvements. When undertaken with the participation of local women and of social scientists who are familiar with the demographic characteristics and social structure of the types of communities involved, it is possible to draw samples of major types of households. For those, carefully targeted interviews can reveal a great deal about linkages among significant factors in the household environment. These factors include the physical conditions of water supply and waste disposal as perceived by the women who make the critical behavioral choices, their information as to health consequences, their values affecting water and waste handling, and their perception of community problems and of possible ways to deal with those problems. This is bound to lead to appraisal of the roles of women in community decisions and of means of strengthening them.

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