DETERMINING PERSONAL AND DOMESTIC HEALTH AND HYGIENE KNOWLEDGE, ATTITUDES AND BEHAVIOUR : A PILOT STUDY

by

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aetiology, transmission and prevention of diarrhoea and eye/skin infections.

This information was used to develop and test a structured knowledge, attitudes and behaviour questionnaire. There were 45 knowledge items (signs/symptoms, aetiology, transmission and prevention of diarrhoea); a 10-item attitude scale and a 10-item behavioural scale.

Ivory Park, a peri-urban informal site and service settlement in Midrand (Gauteng), and Tembisa were selected as the study sites because there are a mixture of different levels of water and sanitation provision.

In Ivory Park, the Winnie Mandela squatter camp has limited/no access to water and sanitation; Extensions 6, 8 and Kanana (Ivory Park) have individual (outside the house) or shared access to a tap and stand access to an aqua privy (septic tank). Tembisa has inside or outside piped water and a waterborne sewerage system.

Interviews and observations were conducted in 90 randomly selected households in Ivory Park : 30 in Extension 6, 30 in Kanana and 30 in Zone 3 Winnie Mandela squatter camp. The structured questionnaire was administered in 240 randomly selected households (80 from Zone 4 Winnie Mandela, 80 from Extension 8, Ivory Park and 80 from Lifateng, Tembisa).

Descriptive statistics and frequency tables were the first step in the data analysis. Thereafter, Chi-squared tests, t tests, Mann-Whitney U tests, Pearson correlation coefficients, alpha coefficients, factor analysis, and multiple analysis of variance were used to analyse the data further.

Major Findings :

Socio-demographics : There were no significant differences between the three groups of female interviewees on age, schooling, marital status, employment status, household head and household size in the first phase of the study. However, in the second phase of the study, women from Tembisa, in comparison with women from the squatter camp, were older, less educated, married and employed. Women from the squatter camp were less likely to have their own dustbin, a television and a refrigerator than women from Ivory Park and Tembisa.

Water : Only 25 (28%) out of the 90 households used 20 litres or more of water per person per day; with less households in Kanana (10%) using 20 litres per person per day than in Extension 6 (33%) or the squatter camp (40%). The average number of litres used per person per day was 18 litres in the squatter camp; higher than the 15 litres/person/day in Extension 6 and 12 litres/person/day in Kanana. Most women said that they used the water for drinking, cooking and washing clothes. Water was collected in 20 or 25 litre plastic drums; originally used for cooking oil, chemicals or hair products.

EXECUTIVE SUMMARY

Background and motivation :

Increasing attention has been focussed upon the integration of water supply, sanitation and health promotion programmes in order to achieve community health benefits. Hygiene health education programmes have been recommended to improve hygiene practices, since poor personal and environmental hygiene behaviour are contributory factors in water and sanitation-related diseases.

Existing South African health and hygiene education programmes are scattered, uncoordinated, unrelated to water and sanitation infrastructure provision, and have had little impact on changing personal and environmental hygiene behaviour.

One of the terms of reference for the Hygiene Education and Awareness Task Team (HEATT) is to establish a regional or context-based understanding of existing health and hygiene knowledge, beliefs and practices. The current research project took cognisance of this term of reference by designing a methodology and measures to implement this strategy.

Aim and objectives :

The overall aim of the study was to develop a methodology and measures to assess knowledge, attitudes and behaviour, in relation to personal and domestic health and hygiene. The specific objectives were to :

* Ascertain knowledge of signs/symptoms, aetiology, transmission and prevention of diarrhoea.
* Determine personal and domestic hygiene attitudes and behaviour.
* Investigate the reliability (internal consistency) and the basic dimensions of an attitudinal and a behavioural scale.
* Explore the relationships among knowledge, attitudes and behaviour.
* Determine socio-demographic effects on knowledge, attitudes and behaviour.
* Develop explanatory models of knowledge, attitudes and behaviour.

Methodology :

A household interview schedule and observation checklist was used to obtain information on : (1) background details (age, marital status, language preference, schooling, occupation, household head and number of persons in the household); (2) water supply, storage and use; (3) sanitation supply and use; (4) waste management; (5) lighting and cooking; (6) personal and domestic health and hygiene; and (7)

Sanitation : Squatter camp residents had built their own pit latrines, which were not used by small children. Therefore, adequate sanitation was a major need for these residents. The problems experienced with aqua privies (overflowing, desludging needed) suggested that this system was inadequate for sanitation. Toilet paper and newspaper were used for anal cleansing; more women in the squatter camp used newspaper than in Kanana or Extension 6. Irrespective of area, disinfectants were used to clean aqua privies and pit latrines.

Personal and domestic hygiene : Less (53%) women washed their hands before preparing food than before eating (82%) or after going to the toilet (94%). Just over half of the women (54%) used soap when they washed their hands. Although women in the squatter camp were more likely to use water only when washing their hands, they were equally likely to have soap in their houses as women in the other two areas. Most women (86%) with children bathed them daily. Food hygiene was of considerable importance; milk, meat and vegetables were either eaten immediately or refrigerated. Houses in the squatter camp were rated as cleaner than those in Extension 6 or Kanana.

Diarrhoea : Watery bloody stools, sunken eyes and sunken fontanelle were recognised as the major signs/symptoms of diarrhoea. Dirt, dirty food, dirty water, germs and dirty dishes/utensils were perceived as the major causes of diarrhoea. Respondents were aware of the fact that diarrhoea was transmitted by rubbish and stools, insects, and dirty hands, dishes and toilets. Women thought that diarrhoea was prevented by eating healthy food, drinking clean water, keeping dishes clean, cleaning toilets, keeping the house and yard clean and covering garbage. Although the cause of diarrhoea was not as well understood as signs/symptoms, transmission and prevention, Ivory Park women were more knowledgeable about diarrhoea than women from the squatter camp or Tembisa.

Attitudes : It was less important for Tembisa women to have clean dishes and utensils; covering and cleaning water containers; covering food; and washing their hands with soap before preparing food, before eating and after going to the toilet than women in the squatter camp or Ivory Park. Coefficient alpha was 0.87, demonstrating a high level of scale reliability. The factor structure of the scale reflected a combination of domestic and personal hygiene items (eg, clean dishes, clean water containers and washing hands after going to the toilet).

Behaviour : Ivory Park women were more likely to wash their hands with soap after going to the toilet, before preparing food and before eating than Tembisa women. Coefficient alpha was 0.87, showing a high level of scale reliability. The factor structure reflected personal hygiene, with the emphasis on washing hands after going to the toilet.

Inter-relationships : Knowledge, attitudes and behaviour were significantly related to each other. The higher the knowledge about diarrhoea, the more positive the attitude towards personal and domestic hygiene, and the more likely the behaviour would be performed.

Models : The best explanatory models for knowledge, attitudes and behaviour contained eight variables (age group, schooling, refrigerator, water, sanitation and waste storage). As the dependent variables were inter-correlated, these were also included in the models. Eight variables explained 73% of the variance in knowledge about diarrhoea; 59% of the variance in attitudes towards personal and domestic hygiene; and 81% of the variance in personal hygiene behaviour.

Conclusions :

* An adequate water supply was not synonymous with usage.

* Residents of the squatter camp needed more taps to reduce waiting time for collecting water.

* Pit latrines were considered unsuitable for small children.

* Adequate sanitation (not overflowing, no smells) was perceived as very important by all interviewees.

* Ivory Park women were more knowledgeable about signs/symptoms, aetiology, transmission and prevention of diarrhoea than women in Tembisa or the squatter camp. This high level of knowledge was probably due to the emphasis on hygiene health education at the five Ivory Park clinics (Hikhensile, Bophelong, Thuthukani, Clinic 3 and Rabie Ridge).

* Age, schooling, piped inside water, aqua privy/pit latrine, own dustbin and possession of a refrigerator were important determinants of knowledge about diarrhoea, attitudes towards personal and domestic hygiene and personal hygiene behaviour.

Limitations :

The sample of women from Tembisa were older, less well-educated and in a higher socio-economic status (SES) bracket than women from the squatter camp and Ivory Park. It is possible that the differences found on diarrhoea knowledge, attitudes towards personal and domestic hygiene and personal hygiene behaviour were a reflection of age and schooling rather than other variables (piped inside water, own dustbin, refrigerator). Therefore, future research with these scales needs to match on age and education or control for age and education through analysis of covariance.

Future research with the knowledge about diarrhoea scale, and the personal and domestic hygiene attitudes and behaviour scales needs to ensure an equal number of reversed items to control for social desirability. Otherwise a social desirability measure should be added to these scales, which is used as a covariant in the multivariate analysis.

Recommendations :

Health improvements (ie, decreases in diarrhoea and eye/skin infections) can be achieved through the promotion of personal and domestic hygiene. Therefore, a comprehensive South African hygiene education programme for water and sanitation is essential.

Teachers, nurses, water and sanitation engineers, community health workers, environmental health officers and agricultural extension officers need to be trained to implement the programme. This programme can be initiated in the schools, at clinics, in the media (radio, television) and in the community.

The following aspects of such a programme can include :

* The advantages of using a minimum of 25 litres of water per person per day.
* The reasons for regular cleansing of plastic drums before using them for storage and conveyance.
* The method of construction and the need for regular inspection of pit latrines.
* The requirements for VIP/Pit Latrines/Aqua Privies to operate effectively and the consequences of using disinfectants in pit latrines or septic tanks.
* How to encourage small children to use chamber pots and toilets (steps and baby toilet seat).
* The relationship between faeces and faeco-oral diseases, and the methods of safe disposal for faeces.
* The promotion of washing hands with soap after visits to the toilet, after cleaning babies, and before eating and preparing food.
* The role of soap, and personal and domestic hygiene in the prevention and transmission of illness/disease.
* The advantages of drying hands on clean cloths.
* The advantages of using oral dehydration therapy for the treatment of diarrhoea in children.

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GLOSSARY OF STATISTICAL TERMS

Chi-square-tests : Determining whether two nominal (or higher level) measures are related.

T tests : Determining whether the mean scores for two groups differ significantly.

Mann-Whitney U tests : Nonparametric alternative to the t test for two independent samples.

Pearson correlation coefficients : An index of the relationship between two variables.

Alpha coefficients : An estimate of reliability based on the average correlation among items (internal consistency) and the number of items.

Factor analysis : A broad category of approaches to conceptualizing groupings (or clusterings) of variables and an even broader collection of mathematical procedures for determining which variables belong to which groups.

Multiple analysis of variance : Used to explain as much variation of inter-related variables as possible.

P : Probability that there is a significant difference between groups. The 95% level ($p \leq 0,05$) is the normal cut-off point.

1. INTRODUCTION

Lack of a potable and adequate water supply along with facilities for the safe disposal of excreta account for up to 50% of the health problems in developing countries.[1] Although water and sanitation interventions are assumed to have a positive impact on diarrhoeal incidence and other water and sanitation-related diseases,[2] increased availability "does not in itself ensure increased access, utilisation and health improvements" (p. 140).[1]

Increasing attention has been focussed upon the integration of water supply, sanitation and health promotion programmes in order to achieve community health benefits.[2-6] Hygiene health education programmes have been recommended to improve hygiene practices, since poor personal and environmental hygiene behaviour are contributory factors in water and sanitation-related diseases.[3-5]

Existing South African health and hygiene education programmes are scattered, unco-ordinated, unrelated to water and sanitation infrastructure provision,[6] and have had little impact on changing personal and environmental hygiene behaviour (personal communication, Piers Cross).

It is well-known that improving knowledge does not necessarily lead to changes in behaviour.[7] Knowledge is an essential component of any health education programme, but behavioural change is heavily influenced by beliefs, attitudes, subjective norms and enabling factors.[8] It is possible that the effectiveness of South African health and hygiene education programmes has been compromised by not determining "the factors which underlie a person's decision to perform or not perform a behaviour" (p. 134).[8]

The following literature review focuses on three inter-related issues : diarrhoea as a major public health problem; the health benefits of water and sanitation; and knowledge, attitudes, beliefs and practices (KABP) studies in relation to water and sanitation. The scope of the research is then defined according to the Hygiene Education and Awareness Task Team (HEATT) and the literature review.

1.1 Diarrhoea

Diarrhoea is the most common childhood illness, and one of the major causes of infant and child mortality. In 1992, Bern, Martines, de Zoysa and Glass[9] published a ten-year global update on diarrhoeal morbidity and mortality, based on data from studies conducted in Africa, South America and Asia (excluding China); indicating that diarrhoeal morbidity and mortality is predominant mostly in developing countries.

The incidence of diarrhoea was 2.6 episodes per child (under 5 years of age) per year; similar to the incidence of 2.2 reported by Snyder and Merson in 1982.[10] Diarrhoeal morbidity, for children under five years of age, was estimated at 1 billion episodes per annum, with 3.3 million deaths every

year.[9] Although mortality appears to have declined from the 1982 estimate of 4.6 million deaths,[10] the wide range (1.5-5.1 million) suggests that this interpretation be treated with caution.

Even more problematical is the continued high morbidity and mortality rates, despite the introduction of diarrhoea control programmes. The multi-factorial nature of diarrhoea makes it imperative for control programmes to broaden their scope, "beyond treatment based on oral dehydration therapy alone" (p. 705).[9]

In South Africa, diarrhoeal morbidity has been estimated at 1.5 million cases per annum for children under five years of age.[4] Diarrhoea was the leading cause of death in Coloured and African children in 1985 : accounting for 29.2% (Coloured) and 26.3% (African) of deaths in the 1-4 years age group.[11] Five years later, diarrhoea was still the leading cause of death in most areas of South Africa for the age group 1-5 years.[12]

It is highly likely that current diarrhoeal morbidity and mortality rates remain unchanged for these vulnerable groups, given their lack of access to water and sanitation, and the over-crowded living conditions experienced in the townships and squatter camps.

Although hygiene education is regarded as essential for diarrhoea control, and has, in two studies been associated with a reduction in diarrhoeal morbidity,[13,14] the effectiveness of education alone in improving knowledge and changing behaviour remains doubtful.[7,8] A consistent finding from a wide variety of studies is the low level of knowledge concerning the aetiology, transmission and prevention of diarrhoea (South Africa, Lesotho, Zaire, Pakistan, and Bangladesh).[15-20] Obviously, if people do not understand the reasons for adopting certain behaviours, then health education will be ineffective.

Feachem[21] has estimated that improvements in personal and domestic hygiene can reduce diarrhoeal morbidity by up to 48%. The Bangladesh study[13] reported a 26% decrease in diarrhoeal morbidity, attributable to improvements in personal and domestic hygiene. The problem with this study is that only one targeted behaviour improved : hand-washing before preparing food. There were no improvements in defecation and waste disposal practices, making interpretation of results problematical.

A community-based hygiene intervention study in Zaire reported an 11% reduction in the risk of reporting diarrhoea during the peak diarrhoeal season for children in the intervention communities as compared with control communities.[14] The findings from this study suggest that improvements in personal and domestic hygiene have the potential for breaking transmission of diarrhoea, at a lower level than Feachem's estimate.[21] This is not surprising as transmission involves a complex interaction of environmental,

biological, socio-cultural and behavioural factors.[15]

1.2 The Health Benefits of Adequate Water and Sanitation

In South Africa, it has been estimated that "approximately 12 million people lack an adequate water-supply and more than 18 million have unacceptable sanitation facilities" (p. 883).[22] According to Eberhard and Quick,[22] the minimum acceptable levels of water and sanitation provision in urban areas are : a communal standpipe with a treated safe water supply within a 100 metres of every urban household; and a ventilated improved pit latrine or an on-site aqua privy system. The 1994 White Paper on Water Supply and Sanitation Policy defined basic adequate services as : "potable water supply of 25 l/person/day within 200m cartage distance, and a ventilated improved pit latrine" (p.38).[23]

A considerable amount of research has been conducted over the last 30 years on the health benefits of adequate water and sanitation provision; justifiable on the grounds that : "Improvements in water supplies and sanitation facilities are believed to reduce the transmission and ingestion of faecal-oral pathogens, particularly the major infectious agents of diarrhoea" (p. 117).[24] Various researchers (eg, Feachem and Esrey) have documented their concerns that the mere provision of services does not guarantee a decline in diarrhoeal morbidity and mortality rates.

At the heart of the problem is usage. There is evidence from South Africa and Lesotho that, despite improved water supplies, water usage is less than 20 litres per capita per day; in some cases less than 10 litres per capita per day.[16,25-27] Although service providers are well-aware that a minimum of 25 litres per capita per day are essential for healthy living, this message does not appear to have been grasped by the general population.

African children, under the age of 6 years, do not use pit latrines since their parents regard them as unsafe for small children.[25] Owners of pit latrines may use them for the safe disposal of children's faeces but it is doubtful whether this behaviour will occur, given the findings from the Bangladesh study on this specific targeted behaviour.[13]

Esrey[28] has recently analysed the relationships among improved water supply and sanitation and diarrhoea and nutritional status in eight countries (Burundi, Ghana, Togo, Uganda, Sri Lanka, Morocco, Bolivia and Guatemala). Optimal (on the premises) and intermediate (improved public water) water supplies were compared with unimproved water. Optimal (flush toilets or water sealed latrines) and intermediate (latrines) sanitation levels were compared with unimproved sanitation.

Incremental improvements (none, intermediate and optimal) in sanitation were associated with less diarrhoea and increases in children's weight and

height. The effects of improved sanitation were greater for urban than for rural children. Benefits from improved water occurred only when sanitation was improved and only when optimal water was present.[28] It would appear that improved sanitation has a greater impact on health than improved water supplies.

Esrey[28] considers that the health differences between optimal and intermediate sanitation facilities are related to usage patterns. He recommends encouraging all members of the household to use intermediate facilities at all times, including the appropriate disposal of young children's faeces. This means that providers of services need to take into account the required software (ie, hygiene education) to optimise usage.

1.3 KABP Studies on Water and Sanitation

Myburgh[29] has reviewed the literature on KABP studies for the national Hygiene Education and Awareness Task Team (HEATT). The major problem with this review is the emphasis placed on a national KABP South African study on water and sanitation practices,[25] implying redundancy for current or future KABP studies.

The South African study[25] used reprocessed data collected by the Human Sciences Research Council (HSRC) during the period July 1987 to March 1989, and refers to KwaZulu-Natal. This study is definitely dated, given the changes that have occurred in South Africa during the intervening years, and cannot be described as a national study since the emphasis is on KwaZulu-Natal. Nevertheless, the information on water and sanitation usage (less than 12 litres per capita per day, and the lack of use by small children of pit latrines) concurs with other studies in similar areas.[26,30]

Most KABP studies report significant education and socio-economic status effects.[29] This implies tailoring of health education messages for target groups. Therefore, it is essential for current and future KABP studies on water and sanitation to ascertain educational and occupational levels, as there is no point in developing and distributing written pamphlets to illiterate persons.

To reiterate : health education can be successful if the number of messages are few; they are of proven benefit to an individual or a community; and they are repeated frequently, using a wide variety of fora.[31]

1.4 The Scope of the Study

One of the terms of reference for the Hygiene Education and Awareness Task Team (HEATT)[32] is to establish a regional or context-based understanding of existing health and hygiene practices, beliefs and knowledge. The current research project took cognisance of this term of

reference, by designing a methodology and measures to implement this strategy.

In addition, the literature review revealed that knowledge concerning diarrhoea was sadly lacking, and improvements in personal and domestic hygiene were needed to break transmission of diarrhoea. Therefore, a structured questionnaire on knowledge about diarrhoea and personal and domestic hygiene attitudes and behaviour was developed as the basis for implementing hygiene education programmes.

2. AIM AND RESEARCH OBJECTIVES

2.1 Aim

The overall aim of the study was to develop a methodology and measures to assess knowledge, attitudes and behaviour, in relation to personal and domestic health and hygiene.

2.2 Objectives

The specific objectives of the research were to :

2.2.1 Develop measures to assess :
- (1) knowledge about diarrhoea;
- (2) attitudes towards personal and domestic hygiene; and
- (3) personal hygiene behaviour.

2.2.2 Ascertain knowledge of signs/symptoms, aetiology, transmission and prevention of diarrhoea.

2.2.3 Determine personal and domestic hygiene attitudes and behaviour.

2.2.4 Investigate the reliability (internal consistency) and the basic dimensions of an attitudinal and a behavioural scale.

2.2.5 Explore the relationships among knowledge, attitudes and behaviour.

2.2.6 Determine socio-demographic effects on knowledge, attitudes and behaviour.

2.2.7 Develop explanatory models of knowledge, attitudes and behaviour.

3. METHODOLOGY

3.1 Research Design

Qualitative techniques (semi-structured interviews and observation) were used to ascertain what different groups and individuals knew, felt, thought and behaved with regard to personal and domestic health and hygiene. This information was used to develop and test a structured knowledge, attitudes and behaviour questionnaire.

3.2 Study Sites

Ivory Park, a peri-urban informal site and service settlement in Midrand (Gauteng), and Tembisa were selected as the study sites because there is a mixture of different levels of water and sanitation provision. The Winnie Mandela squatter camp has limited/no access to a tap and sanitation. Other stands in Ivory Park have shared or household (outside the house) access to a tap; sanitation provision is by means of a septic tank (aqua privy). In Tembisa, there is piped water inside or outside the house and a waterborne sewerage system (Appendix A).

3.3 Measures

A household semi-structured interview schedule and observation checklist was designed for the first phase of the study. A structured knowledge, attitudes and behaviour questionnaire was designed for the second phase of the study.

3.3.1 Interview Schedule and Observation Checklist

A household semi-structured interview schedule and observation checklist was designed to obtain information on :

(1) Background details (age, marital status, language preference, schooling, occupation, household head and number of persons in the household);
(2) Water supply, storage and use;
(3) Sanitation supply and use;
(4) Waste management;
(5) Lighting and cooking;
(6) Personal and domestic hygiene; and
(7) Aetiology, transmission and prevention of diarrhoea and eye/skin infections (Appendix B).

The observation checklist determined the type of house, the presence of household goods (TV, radio, refrigerator, stove, oven and car) and the cleanliness of the house, surroundings and persons (Appendix B).

3.3.2 Knowledge, Attitudes and Behaviour Questionnaire

A structured knowledge, attitudes and behaviour questionnaire was developed to obtain information on socio-demographic details (age; marital status; schooling; occupation; ownership of a TV, refrigerator, stove, oven and radio; and type of water supply, sanitation and waste storage), (Appendix C).

There were 45 knowledge items : 10 for signs/symptoms of diarrhoea; 10 for aetiology (cause) of diarrhoea; 10 for transmission (spread) of diarrhoea; and 15 for prevention of diarrhoea. All knowledge items were answered by Yes, No or Don't Know. Correct responses were scored 1; incorrect and don't know responses were scored 0 (Appendix C).

Correct responses were :

Signs/symptoms :	Yes for items 2, 5, 6, 8, 9 and 10. No for items 1, 3, 4 and 7.
Cause :	Yes for items 1, 4, 6, 7 and 10. No for items 2, 3, 5, 8 and 9.
Transmission :	Yes for items 1, 4, 5, 6, 7, 8, 9 and 10. No for items 2 and 3.
Prevention :	Yes for items 1 to 11 and 13 to 15. No for item 12.

The 10-item attitude scale consisted of items designed to measure attitudes towards personal and domestic hygiene. Responses were scored from 0 (very unimportant) to 3 (very important) and summed to determine overall attitudes to personal and domestic hygiene; the higher the score, the more positive the attitude.

The 10-item behavioural scale consisted of items that emphasised personal hygiene, such as washing hands with soap after urinating; after defecating; before eating; and before preparing food. These behaviours were selected as the most important personal preventative aspects of diarrhoea. Responses were scored from 0 (never) to 3 (always) and summed to ascertain overall personal hygiene behaviour; the higher the score, the more often the behaviour was performed.

3.4 Sampling

Previous experience with fieldwork in Ivory Park (ie : absentee residents, interviewer abuse, shooting incidents, refusals), necessitated drawing twice as many stand numbers than were required.

For the initial qualitative section of the study, a simple random sample of 180 stand numbers was drawn from three areas : 60 out of 1 239 stands from Extension 6, Ivory Park; 60 out of 869 stands from Kanana; and 60 out of 347 stands from Zone 3, Winnie Mandela squatter camp.

For the quantitative aspect of the study, a simple random sample of 480 stand numbers was drawn : 160 out of 419 stands from Zone 4, Winnie Mandela; 160 out of 2 333 stands from Extension 8, Ivory Park; and 160 out

of 521 stands from Lifateng, Tembisa.

3.5 Procedure

Two trained female interviewers, who were residents of the area, were employed to assist with the project. The interviewers were given maps of the area, with the stand numbers marked on them. For the first phase of the study, the interviewers were instructed to interview 90 adult women (aged 20 years and older) : from 30 households in each of the three areas (Kanana; Extension 6, Ivory Park; and Zone 3, Winnie Mandela). Where there was more than one dwelling unit on a stand, interviewers were instructed to randomly select one unit. For the second phase of the study, the interviewers administered the questionnaire to 80 adult women in each of the three areas (Extension 8, Ivory Park; Zone 4,Winnie Mandela; and Lifateng, Tembisa).

Two coding forms were designed to allow for data capture of the information from the interviews and questionnaire. Information from the interviews was pre-coded and captured in an Epi-Info (Version 6.02) file by the two interviewers. Questionnaire data were captured in an ASCII file and the statistical package SPSS was used for data analysis.

3.6 Data Analysis

Descriptive statistics and frequency tables were the first step in the data analysis. Thereafter, Chi-squared tests, t tests, Mann-Whitney U tests, Pearson correlation coefficients, alpha coefficients, factor analysis, and multiple analysis of variance were used to analyse the data further.[33-38]

Establishing reliability is the first priority for scale development. The reliability coefficient is determined from the inter-correlations of items on a measure; its size is based on the average correlation among items (internal consistency) and the number of items.[33] In accordance with Nunnally's proposals,[33] coefficient alpha was used to ascertain the internal consistency of the attitudinal and behavioural scales.[34]

The two scales were subjected to factor analysis to determine underlying attitudinal and behavioural dimensions. A direct solution (principal components analysis)[34] was the first step. As items with unique variance >0,60 tend to be unreliable,[36] only items with commonality estimates $\geq$ 0,40 were taken into consideration.

Orthogonal (VARIMAX) and oblique (OBLIMIN) rotational solutions were used and comparisons made between the two methods to achieve simple structure.[37] In order to ascertain significant loadings at the 1% level, loadings >$\pm$ 0,50 were examined.[33,36]

As knowledge, attitudes and behaviour are multivariate phenomena,[36] multiple analysis of variance was used to develop explanatory models of knowledge, attitudes and behaviour.

4. RESULTS

4.1 Interview Data

4.1.1 Background Details

Ninety women, aged between 21 and 56 years (average age = 35,5 years, sd = 8.9) were interviewed (Table 4.1). Only five women (6%) had not received any formal education. Age group was significantly related to schooling (Chi-square = 25,86; df = 6; $p < 0,001$), with women in the 40+ age group having lower educational levels than women in the two younger age groups.

Fifty nine per cent said that they were married. A man was head of the household for 52 married women and 16 single women; 22 households were headed by females. Only 36% of the women were employed, mostly in low level occupations such as cleaners and packers. The major language groupings were Zulu (37%) and Pedi (34%). In the 90 households there were 355 persons (average household size = 3,9 persons). Household size was slightly lower in Winnie Mandela than in Kanana and Extension 6, Ivory Park.

There were no significant differences between the three groups of interviewees on age, schooling, marital status, employment status, household head and household size.

Table 4.1 Background Details for Interviewees

BACKGROUND DETAILS		n	%
Age :	21 - 29 years	22	24
	30 - 39 years	43	48
	40 - 49 years	17	19
	50+ years	8	9
Schooling :	None	5	6
	Primary	30	33
	Lower Secondary	24	27
	Higher Secondary	31	34
Language :	Zulu	33	37
	Pedi	31	34
	Other*	26	29
Household members :	Over 20 years	212	60
	13 - 20 years	39	11
	6 - 12 years	43	12
	Under 6 years	61	17

* Xhosa, Tsonga, Ndebele, Venda, Swazi

4.1.2 Water Supply, Storage and Use

Most households in Kanana and Ivory Park 6 had a tap on their stand. There were significant differences on distance to the water supply (Chi-square = 90,00; df = 6; $p < 0,001$), with women in Winnie Mandela going further for their water than women in the other two areas.

Water was usually collected in 20 litre (51%) or 25 litre (43%) plastic drums. These drums originally contained cooking oil, chemicals or hair products. Eleven women (12%) said that they collected water once a day, 24 (27%) twice a day, 34 (38%) three times a day and 20 (23%) four times a day. The number of litres of water used per person per day was assessed from the container size, the number of times water was drawn each day, and the number of persons in the household.

The mean number of litres used per person per day was 11,77 litres in Kanana; 14,53 litres in Extension 6, Ivory Park; and 17,99 litres in the squatter camp.

Only 25 (28%) households used 20 litres or more of water per household member. There were significant differences on water usage (Chi-square = 7,4; df = 2, p = 0,02), with less households in Kanana (10%) using 20 litres per person per day than in Extension 6 (33%) or Winnie Mandela (40%).

There were significant differences on payment for water (Chi-square = 48,6, df = 4, p < 0,001), with most women (27) in the squatter camp paying nothing.

Water containers were usually stored on the floor, in a covered container, and were cleaned every day by 56%, before fetching water by 15% and twice a week by 29%. Most women (89%) cleaned the container with soap and water.

When asked what they used the water for : 88 women mentioned drinking; 87 women said cooking; 78 women said washing clothes; 60 women mentioned bathing; and 29 women mentioned cleaning the house and surroundings. Washing water was re-used in the toilet, and used for watering the yard when it was dusty, watering the garden and cleaning the house.

4.1.3 Sanitation Supply and Use

All 60 households in Kanana and Extension 6, Ivory Park had an aqua privy; in the squatter camp, 25 households had a pit latrine (built by themselves), and five households shared five different neighbours' pit latrines. There were significant differences on small children's use of the toilet (Chi-square = 9,95; df = 2; p = 0,01). Small children did not use the pit latrines in the squatter camp as they were regarded as unsuitable for small children. One interviewee mentioned that a young child fell into one of these latrines and died.

Of the 22 women who said that their children did not use the toilet, 10 used nappies, eight said that the child used the yard and four said that the child went behind the toilet. Nineteen mothers and two caregivers said that they cleaned the child after it had been to the toilet.

Sixty women (67%) used toilet paper for anal cleansing, 27 (30%) used newspaper and three used soap and water. More women in the squatter camp used newspaper than women in Kanana and Extension 6, Ivory Park (Chi-square = 6,8; df = 2; p = 0,03).

Most interviewees (78%) cleaned the toilet themselves and 20 women said that their daughters cleaned the toilet. Toilets were

cleaned with soap and water (46%), or soap, water and Jeyes Fluid (48%); only six women used water alone. The major problems with toilets in the squatter camp were the temporary, ramshackle nature of the structures and smells; in Kanana and Extension 6, Ivory Park, the aqua privies were overflowing and needed desludging.

4.1.4 Waste Management

Household waste was put in a plastic bag inside the house and then in a dustbin outside the house. Refuse was collected once a week in the squatter camp and Extension 6, Ivory Park and twice a week in Kanana. Irrespective of area, most women were bothered by flies in the kitchen (78%) and toilet (80%). Fly spray was used by 73% to control flies.

4.1.5 Lighting and Cooking

Electricity was used for lighting in Extension 6, Ivory Park and Kanana, and candles in the squatter camp (Chi-square = 81,3; df = 2; $p < 0,001$). For cooking, most women in Kanana used electricity; in Extension 6, Ivory Park, women used electricity or paraffin stoves; and in the squatter camp most women used paraffin stoves (Chi-square = 36,3; df = 2; $p < 0,001$).

4.1.6 Personal and Household Hygiene

Seventy four (82%) women said that they washed their hands before eating, 85 (94%) after going to the toilet, 48 (53%) before preparing food, and 16 (18%) first thing in the morning. Forty nine women (54%) said that they washed their hands with soap, 10 (11%) with soap sometimes, and 31 (34%) with water only. Although women in the squatter camp were more likely to use water only when washing their hands (Chi-square = 10,2; df = 4; $p = 0,04$), they were equally likely to have soap in their houses as women in Kanana and Extension 6, Ivory Park ($p = 0,91$).

Forty nine women (54%) said they washed their hands to get rid of germs and 41 women (46%) to prevent disease. Soap was considered to be useful in preventing diseases, since it removed dirt from the hands and nails. Towels were used by 25 women (28%) to dry their hands, dry cloths by 26 women (29%), 21 women (23%) airdryed their hands, and 18 women (20%) dried their hands on their clothes.

Eighty women (89%) used soap and water to wash their dishes and ten women (11%) used water, soap and Jik. Dishes were usually dried on a clean dry cloth (73%) or left to airdry (27%).

Nineteen women (22%) said that they kept their vegetables in the fridge, 22 (24%) cooked them immediately, 22 (24%) put them on a vegetable rack, 24 (27%) put them in a dish and three (3%) did not buy vegetables. Meat was either stored in the fridge (34%) or eaten immediately (66%). Milk was stored in the fridge (34%), used immediately (46%), put in a cupboard (3%) or not bought (17%). Leftovers were put in the fridge (29%) or kept in covered pots (62%).

4.1.7 Aetiology, Transmission and Prevention of Diarrhoea, and Eye/Skin Infections

Women thought that diarrhoea was caused by dirt (63%), dirty food (48%), dirty water (31%), unhealthy food (51%), germs (9%) and flies (9%). Most women (58%) thought that consulting medical persons would stop transmission; 33% thought that keeping oneself and surroundings clean would stop transmission, and 9% said that they didn't know. Interviewees from the squatter camp were more likely to say consulting medical persons than women from Kanana and Extension 6, Ivory Park (Chi-square = 23,5; df = 4; $p < 0,001$).

Respondents believed that diarrhoea was prevented by eating healthy food (61%), drinking clean water (24%), oral rehydration (39%), and keeping oneself and surroundings clean (33%).

Aetiology, transmission and prevention of eye/skin infections was not as well understood as diarrhoea. Over half of the interviewees said that they didn't know the cause of eye/skin infections, how they were transmitted, and how to prevent them. Some women thought that eye/skin infections were caused by dust, smoke and sun. The major means of preventing transmission was to consult a medical person.

4.1.8 Type of House

Thirty seven houses (42%) were made of corrugated iron, 26 (29%) were made of boards, 12 (13%) were made of planks and 14 (16%) were made of bricks. Most houses (49%) had two rooms. The average number of rooms was 2,3 (sd = 0,9). Most houses (49%) in the squatter camp were made of boards or planks. The brick houses were in Kanana (9) and Extension 6, Ivory Park (5).

4.1.9 Household Possessions

There was a TV in 63 (7%) households; a radio in 71 (79%) households; a refrigerator in 28 (31%) households; a stove in 15 (17%) households; and an oven in 10 (11%) households. Households in the squatter camp were less likely to have a TV

(p = 0,02), a refrigerator (p = 0,002) and a stove (p = 0,05) than houses in Kanana and Extension 6, Ivory Park.

4.1.10 Observed Cleanliness of The House, Surroundings and Persons

The cleanliness of the house, surroundings and persons was rated as good or not good, based on Yusuf and Hussain's criteria.[39] Cleanliness of the house, surroundings and persons was rated as good where the following applied :

1. Swept house and yard
2. No refuse/rubbish on the floor of the house
3. Clean dishes
4. Leftover food kept covered
5. Covered/clean water containers
6. No flies/cockroaches on food in the house
7. Water containers kept clean
8. Household waste removed from the house at least once daily
9. No chickens in the kitchen
10. No faeces around the toilet or on the seat
11. No faeces/rubbish in the yard
12. Clean clothes
13. No bad smells

There were significant differences on living quarters (p = 0,001), kitchen (p = 0,02) and water containers (p = 0,04), with houses in the squatter camp rated as cleaner than houses in Kanana and Extension 6, Ivory Park.

Table 4.2 Cleanliness of Houses, Surroundings and Persons

ITEMS	Good		Not Good	
	n	%	n	%
Living quarters	69	78	20	22
Kitchen	47	53	42	47
Yard	46	52	43	48
Toilet	25	29	60	71
Water containers	51	57	38	43
Dishes/utensils	47	61	30	39
Persons	79	90	9	10
Children	42	70	18	30

4.2 Questionnaire Data

4.2.1 Socio-Demographic Details

The questionnaire was administered to 240 women : 80 from Zone 4, Winnie Mandela (the squatter camp); 80 from Extension 8, Ivory Park (site and service); and 80 from Tembisa (formal township). They were aged between 20 and 65 years (average age = 39,3 years, sd = 11,3). Only 13 women (5%), from Extension 8, had received no formal education. Most women (62%) said that they were married.

One hundred and eleven women (46%) said that they were unemployed; 111 (46%) women were employed in predominantly low level occupations (domestic work, packing boxes, cleaning, making tea) or worked in the informal sector selling fruit, vegetables, meat, beer and cold drinks.

Just over half of the women (52%) had piped water on the stand, 6% had piped water inside the house, 11% had shared access to a water tap (1 to 10 stands) and 31% had limited access to water. Sanitation consisted of an inside (6%) or outside (27%) flush toilet in Tembisa; a septic tank (aqua privy) in Ivory Park and a home made pit latrine in the squatter camp. Women in Tembisa and Extension 8, Ivory Park, had their own dustbin; some women from the squatter camp said that they threw their rubbish in the veld.

With regard to household items in working order, the majority of women said that they had a radio (88%) and a television (71%); 56% had a refrigerator; 53% had a stove; and 48% had an oven.

There were significant differences on age; schooling; marital status; employment status (Table 4.3); water and sanitation facilities; household waste management; type of house; and ownership of a television, refrigerator, stove and oven.

Women from Tembisa, in comparison with women from the squatter camp, were older, less educated, married and employed. Women from the squatter camp were less likely to have their own dustbin than women in Tembisa and Ivory Park.

A composite socio-economic index, based on ownership of five household items (radio, television, refrigerator, stove and oven) in working order, was designed. Ownership of each of the five items was scored 1 and summed (possible range : 0-5). Households scoring 0 and 1 were categorised as low sosio-economic status (SES); 2 and 3 medium SES; and 4 and 5 high SES.

Women from Tembisa were predominantly in the high SES category; women from Ivory Park were either high or medium SES; and women from the squatter camp were predominantly low SES.

Table 4.3 Socio-Demographic Details for the Women : Winnie Mandela Squatter Camp (WM), Site and Service (SS) and Formal Township (FT)

Demographic Details		WM	SS	FT
Age Groups :	20-29 Years	31	15	10
	30-39 Years	26	30	19
	40-49 Years	12	26	21
	50+ Years	10	9	30
Schooling :	None	2	11	0
	Primary	24	31	33
	Lower Secondary	20	12	25
	Higher Secondary	34	26	22
Marital Status :	Single	34	17	9
	Married	36	59	55
	Other[a]	11	4	16
Employment Status :	Unemployed	46	39	26
	Employed	31	37	43
	Other[b]	3	4	11

Other[a] Divorced, separated, widowed
Other[b] Housewife, student, pensioner

4.2.2 Knowledge About Diarrhoea

Over 90% of respondents knew that watery bloody stools, sunken eyes and sunken fontanelle were signs/symptoms of diarrhoea; wrinkled skin was recognised by 69%, dizziness by 63% and fever by 55%. Germs, dirty water, dirty food and dirty dishes/utensils were recognised as causal agents of diarrhoea. However, not having a toilet and breathing in bad smells were also thought to cause diarrhoea.

The majority of respondents knew that diarrhoea was transmitted by rubbish and stools, insects, and dirty hands, dishes and toilets. A substantial proportion did not know whether diarrhoea was transmitted by dirty water containers (29%) and dirty drying rags (39%).

Respondents said that diarrhoea was prevented by drinking clean water, keeping dishes/utensils clean, cleaning toilets, keeping the house and yard clean, and covering garbage for over 90% of respondents. Using soap and clean drying rags were not as important for preventing diarrhoea.

Average correct scores on signs/symptoms, transmission and prevention of diarrhoea were higher than those for aetiology (cause) of diarrhoea (Table 4.4). This was due to substantial proportions of don't know and incorrect responses; suggesting many misconceptions on aetiology.

Table 4.4 Knowledge of the Signs/Symptoms, Cause, Transmission and Prevention of Diarrhoea

Variables	Mean	sd	range
Signs/symptoms	7,85	1,64	2-10
Cause	4,68	0,99	1-8
Transmission	7,17	1,84	2-9
Prevention	12,13	2,61	1-15
Overall Knowledge	31,83	5,89	8-40

4.2.3 Attitudes Towards Personal and Domestic Hygiene

For all 10 items, the predominant responses were very important or important, indicating positive attitudes towards personal and domestic hygiene. The average score was 25,99 (sd = 3,62). Coefficient alpha was 0,87, demonstrating a high level of scale reliability.[33]

The correlation matrix was used as the starting point for the direct analysis by the principal components method and three factors were extracted (Tables 4.5 - 4.7).

The commonality estimates ranged between 0,60 and 0,85 and were acceptable.[36] The variance extracted by the first factor was 48,7%, 17,2% for the second factor and 10,5% for the third factor; the total extracted variance for the three factors was 76,3%.

Although the factor patterns were similar for the orthogonal (VARIMAX) and oblique (OBLIMIN) rotational solutions (Tables 4.6 and 4.7), the oblique rotation pushed the loadings even higher or lower than the orthogonal rotation. For the oblique solution, the correlations between factors were 0,27; 0,18 and 0,22. As the OBLIMIN solution had two variables loading on two factors, the VARIMAX solution was considered to be more appropriate in meeting the requirements of simple structure.[34]

Factor loadings are described in terms of the most frequent responses (important or unimportant) to the statements. Factor I had five variables in excess of 0,50. The loadings on Factor I seemed to be related to domestic hygiene. The relevant variables were : clean dishes and utensils (0,90); covering and cleaning water containers (0,84); covering food (0,84); washing hands with soap before drawing water (0,79); and washing fruit and vegetables (0,69).

Factor II had three variables in excess of 0,50. This factor tended to focus on personal hygiene, with its emphasis on washing hands with soap after going to the toilet (0,77), before preparing food (0,85) and before eating (0,81). Factor III had two variables in excess of 0,50; predominantly emphasising domestic hygiene, such as killing flies, cockroaches and insects (0,82) and covering garbage (0,72).

The reliability coefficient, principal component analysis and factor analysis demonstrated that this scale was a useful attitudinal measure.

Table 4.5 Principal Components Matrix for Attitudes Towards Personal and Domestic Hygiene

Variables	Common Factor Loadings			Comm
	I	II	III	h^2
Wash hands after toilet	0,33	0,80	0,01	0,75
Wash hands before preparing food	0,70	0,50	-0,33	0,85
Wash hands before eating	0,74	0,43	-0,31	0,83
Wash hands before drawing water	0,78	-0,18	-0,38	0,78
Wash fruit and vegetables	0,76	-0,15	0,09	0,60
Cover food	0,79	0,36	0,02	0,75
Kill flies/cockroaches/insects	0,47	0,44	0,59	0,77
Clean eating utensils/dishes	0,84	-0,38	0,02	0,85
Cover garbage	0,62	-0,02	0,58	0,72
Cover and clean water container	0,79	-0,34	-0,00	0,74
Eigen-value	4,87	1,72	1,05	7,64
Percentage variance	48,70	17,20	10,50	76,30

Table 4.6 Orthogonal Rotational Solution for Attitudes Towards Personal and Domestic Hygiene

Variables	Factors		
	I	II	III
Wash hands after toilet	- - - -	0,77	- - - -
Wash hands before preparing food	- - - -	0,85	- - - -
Wash hands before eating	- - - -	0,81	- - - -
Wash hands before drawing water	0,79	- - - -	- - - -
Wash fruit and vegetables	0,69	- - - -	- - - -
Cover food	0,84	- - - -	- - - -
Kill flies/cockroaches/insects	- - - -	- - - -	0,81
Clean eating utensils/dishes	0,90	- - - -	- - - -
Cover garbage	- - - -	- - - -	0,72
Cover and clean water container	0,84	- - - -	- - - -

Table 4.7 Oblique Rotational Solution for Attitudes Towards Personal and Domestic Hygiene

Variables	Factors		
	I	II	III
Wash hands after toilet	- - - -	0,78	- - - -
Wash hands before preparing food	- - - -	0,89	- - - -
Wash hands before eating	0,51	0,86	- - - -
Wash hands before drawing water	0,81	- - - -	- - - -
Wash fruit and vegetables	0,74	- - - -	- - - -
Cover food	0,86	- - - -	- - - -
Kill flies/cockroaches/insects	- - - -	- - - -	0,84
Clean eating utensils/dishes	0,92	- - - -	- - - -
Cover garbage	0,53	- - - -	0,74
Cover and clean water container	0,86	- - - -	- - - -

4.2.4 Personal Hygiene Behaviour

The most frequent responses for these 10 items were always or sometimes. Respondents were more likely to wash their hands before eating than after defecating or urinating ($p < 0,001$). The average score was 23,30 (sd = 6,22). Coefficient alpha was 0,87, showing a high level of scale reliability.[33]

The correlation matrix was used as the starting point for the direct analysis by the principal components method and three factors were extracted (Tables 4.8 - 4.10).

The commonality estimates ranged between 0,45 and 0,84 and were acceptable.[36] The variance extracted by the first factor was 46,5%; 14,4% for the second factor and 9,4% for the third factor; the total extracted variance for the three factors was 70,2%.

The factor patterns were similar for the orthogonal (VARIMAX) and oblique (OBLIMIN) rotational solutions. For the oblique solution, the correlations between factors were -0,07; 0,28 and 0,05. The VARIMAX solution was selected as meeting the requirements of simple structure, as this solution had no variables loading on more than one factor.

Factor loadings are described in terms of the most frequent responses (always, often, sometimes, never) to the behavioural items. Factor I had six variables in excess of 0,50. The loadings on Factor I were predominantly related to personal hygiene (VARIMAX solution), with the emphasis on washing hands with soap after urinating (0,86); after defecating (0,84); after disposing of children's stools (0,90); after cleaning children's bottoms (0,91); before preparing food (0,76); and washing oneself daily (0,74).

Factor II had two variables in excess of 0,50. This factor tended to focus on domestic hygiene; covering food (0,85), and cleaning eating utensils/dishes (0,72). Factor III had one variable in excess of 0,50; also domestic hygiene : covering the water container (0,86).

The reliability coefficient, principal component analysis and factor analysis demonstrated that this scale was a useful measure of personal hygiene behaviour.

Table 4.8 Principal Components Matrix for Personal Hygiene Behaviour Scale

Variables	Common Factor Loadings			Com
	I	II	III	h^2
Wash hands after urinating	0,86	-0,03	-0,12	0,75
Wash hands after defecating	0,84	-0,08	-0,08	0,72
Wash hands before eating	0,55	-0,05	0,39	0,45
Wash hands before preparing food	0,80	-0,06	0,09	0,65
Wash hands after children's stools	0,76	-0,15	0,09	0,60
Wash hands after cleaning bottoms	0,90	-0,09	-0,14	0,84
Wash body daily	0,75	0,13	-0,13	0,60
Cover food	-0,06	0,70	-0,49	0,74
Clean eating utensils/dishes	0,12	0,83	0,05	0,70
Cover the water container	0,29	0,46	0,68	0,75
Eigen-value	4,65	1,44	0,94	7,03
Percentage variance	46,50	14,40	0,94	70,20

Table 4.9 Orthogonal Rotational Solution for Personal Hygiene Behaviour Scale

Variables	Factors		
	I	II	III
Wash hands after urinating	0,86	- - - -	- - - -
Wash hands after defecating	0,84	- - - -	- - - -
Wash hands before eating	- - - -	- - - -	- - - -
Wash hands before preparing food	0,76	- - - -	- - - -
Wash hands after children's stools	0,90	- - - -	- - - -
Wash hands after cleaning bottoms	0,91	- - - -	- - - -
Wash body daily	0,74	- - - -	- - - -
Cover food	- - - -	0,85	- - - -
Clean eating utensils/dishes	- - - -	0,72	- - - -
Cover the water container	- - - -	- - - -	0,85

Table 4.10 Oblique Rotational Solution for Personal Hygiene Behaviour Scale

Variables	Factors		
	I	II	III
Wash hands after urinating	0,86	- - - -	- - - -
Wash hands after defecating	0,85	- - - -	- - - -
Wash hands before eating	0,52	- - - -	0,50
Wash hands before preparing food	0,79	- - - -	- - - -
Wash hands after children's stools	0,90	- - - -	- - - -
Wash hands after cleaning bottoms	0,91	- - - -	- - - -
Wash body daily	0,74	- - - -	- - - -
Cover food	- - - -	0,85	- - - -
Clean eating utensils/dishes	- - - -	0,71	- - - -
Cover the water container	- - - -	- - - -	0,87

4.2.5 Relationships Among Knowledge, Attitudes and Behaviour

All the scales were significantly and positively related to each other ($p = 0,000$), Table 4.11. These findings revealed that the higher the knowledge about diarrhoea, the more positive the attitude towards personal and domestic hygiene and the more frequently the behaviour was performed.

Table 4.11 Correlation Matrix for the Four Knowledge Scales, Overall Knowledge Scale, Attitude and Behaviour Scales

Scale	2	3	4	5	6	7
Signs	0,31	0,54	0,56	0,74	0,52	0,62
Cause	- - - -	0,41	0,44	0,57	0,33	0,35
Transmit	- - - -	- - - -	0,85	0,91	0,65	0,75
Prevent	- - - -	- - - -	- - - -	0,94	0,67	0,77
Knowledge	- - - -	- - - -	- - - -	- - - -	0,70	0,80
Attitudes	- - - -	- - - -	- - - -	- - - -	- - - -	0,73
Behaviour	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

4.2.6 Socio-Demographic Effects on Knowledge, Attitudes and Behaviour

Address, age, education, type of water supply, type of sanitation, type of waste storage and ownership of a refrigerator were significantly related to knowledge about diarrhoea, attitudes towards personal and domestic hygiene and personal hygiene behaviour.

The most important variable was address. Women from Tembisa had significantly lower levels of knowledge on the signs/symptoms, aetiology, transmission and prevention of diarrhoea than women in the squatter camp or the site and service stands of Ivory Park. In addition, women from Tembisa had significantly less positive attitudes towards personal and domestic hygiene, and were more likely to say sometimes on the personal hygiene behaviour scale than women in the squatter camp or Extension 8, Ivory Park (Table 4.12).

Table 4.12. Mean Scores and Standard Deviations for Knowledge About Diarrhoea, Attitudes and Behaviour by Address

Variables	Squatter		Ivory Park		Tembisa	
	m	sd	m	sd	m	sd
Signs	7,8	1,5	8,8	0,9	7,0	1,8
Cause	4,8	0,9	5,0	0,9	4,3	1,0
Transmit	7,1	1,7	8,6	0,5	5,8	1,7
Prevent	12,2	2,3	13,9	0,5	10,2	2,9
Overall Knowledge	31,9	5,1	36,3	1,6	27,2	5,9
Attitudes	25,8	3,1	28,4	2,6	23,7	2,8
Behaviour	23,3	5,7	28,7	2,2	17,9	4,6

The findings on address necessitated using analysis of covariance (controlling for address), with adjusted means, to tease out socio-demographic effects on knowledge, attitudes and behaviour (Tables 4.13 and 4.14).

On overall knowledge about diarrhoea, women with no formal education or an upper secondary level of schooling scored significantly higher than women with primary school or lower level secondary school. Women who were in the 50+ age group scored significantly lower than women in the three younger age groups. Ownership of a refrigerator was significantly related to high knowledge scores. Piped inside water, having an aqua privy or pit latrine and having one's own dustbin were significantly related to high knowledge scores.

Results for the attitude and behaviour scales were very similar to the overall knowledge scale. Women with no formal education or an upper secondary level of schooling had more positive attitudes than women with primary school or lower level secondary school. On the behaviour scale, women with no formal school were more likely to answer "Always" than women in the three other groups. For the rest of the variables, responses were virtually identical to the knowledge scale.

Table 4.13 Socio-Demographic Effects on Overall Knowledge About Diarrhoea : n and Adjusted Means

Variables		n	Adjusted means
Schooling	None	13	35,8
	Standards 1 - 5	88	30,2
	Standards 6 - 7	57	30,9
	Standards 8 - 10	82	33,7
Age Groups	20 - 29 Years	56	33,5
	30 - 39 Years	75	33,0
	40 - 49 Years	59	32,5
	50+ Years	49	27,1
Refrigerator	Yes	134	33,7
	No	106	30,0
Water Supply	Piped Inside	14	38,5
	Piped Outside	125	34,5
	Shared (1 - 10 stands)	26	33,4
	Many Users	75	23,5
Sanitation	Inside Flush	14	28,5
	Outside Flush	66	23,6
	Aqua Privy	80	37,2
	Pit	80	36,5
Waste Storage	Own dustbin	163	39,2
	Throw in veldt	36	32,6
	Plastic bag	36	23,9

Table 4.14 Socio-Demographic Effects on Attitudes and Behaviour : n and Adjusted Means (AM)

Variables		n	Attitudes AM	Behaviour AM
Schooling	None	13	26,7	28,2
	Standards 1 - 5	88	25,4	22,3
	Standards 6 - 7	57	25,4	21,7
	Standards 8 - 10	82	27,0	24,9
Age Groups	20 - 29 Years	56	27,2	24,7
	30 - 39 Years	75	25,9	24,3
	40 - 49 Years	59	26,5	24,0
	50+ Years	49	24,0	19,0
Refrigerator	Yes	134	27,1	26,1
	No	106	24,9	20,5
Water Supply	Piped Inside	14	28,5	31,5
	Piped Outside	125	27,5	27,1
	Shared (1 - 10 stands)	26	26,7	23,6
	Many Users	75	21,8	12,7
Sanitation	Inside Flush	14	24,0	20,4
	Outside Flush	66	22,5	14,9
	Aqua Privy	80	28,7	29,4
	Pit	80	27,4	26,7
Waste Storage	Own dustbin	163	29,8	32,4
	Throw in veldt	36	26,7	23,8
	Plastic bag	36	21,1	13,8

4.2.7 Explanatory Model Development for Knowledge About Diarrhoea, Attitudes Towards Personal and Domestic Hygiene and Personal Hygiene Behaviour

Multivariate analysis of covariance was used for model development. The covariant was address. Only socio-demographic variables that were significant in the previous analyses were entered into the model. These variables were : schooling, fridge, type of

water supply, type of sanitation, type of waste storage and age group. As the dependent variables (knowledge, attitudes and behaviour) were inter-correlated, these variables were entered into the three models (Tables 4.15 - 4.17).[38] The overall knowledge score was re-coded into five groups : 8-20; 21-25; 26-30; 31-35; and 36-40. Scores on the attitude and behaviour scales were re-coded into three groups : 10-20; 21-29; and 30.

Table 4.15 Multivariate Analysis for Overall Knowledge About Diarrhoea

Variable	SS	df	MS	F	sig
Schooling	64,34	3	21,45	2,20	0,089
Fridge	0,10	1	0,10	0,01	0,919
Water	223,98	3	74,66	7,67	0,000
Sanitation	163,11	2	81,56	8,38	0,000
Waste Storage	374,55	2	187,27	19,25	0,000
Age Groups	132,47	3	44,16	4,54	0,004
Attitudes	504,62	2	252,31	25,94	0,000
Behaviour	165,80	2	82,90	8,52	0,000
R^2	0,75				
Adjusted R^2	0,73				

There were no significant schooling and fridge effects in the model, unlike the single analysis. The overall adjusted R^2 was 0,73, showing that this set of eight variables explained 73% of the variance in knowledge about diarrhoea.

Table 4.16 Multivariate Analysis for Attitudes Towards Personal and Domestic Hygiene

Variable	SS	df	MS	F	sig
Schooling	90,21	3	30,07	5,62	0,001
Fridge	10,24	1	10,24	1,91	0,168
Water	43,26	3	14,42	2,70	0,047
Sanitation	38,03	2	19,02	3,55	0,030
Waste Storage	71,06	2	35,03	6,64	0,002
Age Groups	36,03	3	12,01	2,24	0,084
Behaviour	108,54	2	54,27	10,14	0,000
Knowledge	125,36	4	31,34	5,86	0,000
R^2	0,63				
Adjusted R^2	0,59				

Table 4.17 Multivariate Analysis for Personal Hygiene Behaviour

Variable	SS	df	MS	F	sig
Schooling	37,51	3	12,50	1,69	0,170
Fridge	43,70	1	43,70	5,90	0,016
Water	70,24	3	23,41	3,16	0,026
Sanitation	87,61	2	43,80	5,92	0,003
Waste Storage	212,33	2	106,16	14,34	0,000
Age Groups	23,97	3	7,99	1,08	0,359
Knowledge	315,96	4	78,99	10,67	0,000
Attitude	95,19	2	47,60	6,43	0,002
R^2	0,83				
Adjusted R^2	0,81				

There were no significant fridge and age group effects in the attitude model, unlike the single analysis. The overall adjusted R^2 was 0,59, revealing that this set of eight variables explained 59% of the variance in attitudes towards personal and domestic hygiene.

There were no significant schooling and age group effects in the behaviour model, unlike the single analysis. The overall adjusted R was 0,81, showing that this set of variables explained 81% of the variance in personal hygiene behaviour.

These three models demonstrated the importance of socio-economic effects, in particular water supply, sanitation and waste storage, for explaining levels of knowledge, attitudes towards personal and domestic hygiene and personal hygiene behaviour.

5. DISCUSSION

5.1 Water and Sanitation

The average number of litres of water used per person per day was higher in the squatter camp than in Extension 6, Ivory Park or Kanana. This higher consumption may have been due to no payment for water by squatter camp residents. More importantly, the findings on consumption indicated that increasing availability and access to water did not ensure increased utilisation.[1,28]

Although average water consumption was considerably higher in all three areas of Ivory Park than the 6,6 litres per person per day in rural Swaziland,[40] it was surprising to find that water consumption in Extension 6, Ivory Park (14,5 litres) was similar to that of 14,4 litres in Qabane Valley, Lesotho.[16] It would appear that, despite better access and availability of

water, residents of this informal settlement were unaware of the need to use greater quantities of water.

Water was collected in plastic drums, which were stored on the floor in the home. Most observed water containers were covered. These containers were cleaned with soap and water; unlike households in Qabane Valley,[16] where water was collected in rinsed plastic buckets, which were sometimes covered in the home. It would appear that women in Ivory Park have a greater understanding of water contamination than women in Qabane Valley. This greater awareness may be due to these women being better educated than their Lesotho counterparts or receiving more exposure to information on water contamination through the radio and television.

Ivory Park has experienced innumerable problems with aqua privies : they overflow; smell; tanks and soak-aways are too small; are unsuitable for the high ground water table; and require regular desludging. Interviewees who had an aqua privy complained that this system was inadequate sanitation as it overflowed and they had to wait for it to be emptied.

The home made pit latrines in the squatter camp were ramshackle temporary structures, which were considered unsafe for small children, as was found in previous research.[25] Considerable efforts were made to promote the use of improved latrines (close-fitting lid and a smooth, easily cleaned concrete surface) for young children in Maputo.[30] However, there were no changes in the age at which children started using these improved latrines. It is possible that enabling factors,[8] such as a fitted inner seat, were lacking; thereby providing an effective barrier to behaviour change.

As in previous research,[16,25] disinfectants were used for cleaning toilets, even though these are not recommended for septic tanks and pit latrines. It would appear that these interviewees were unaware of the basic requirements for effective sanitation, as well as the consequences of using disinfectants in these systems.

5.2 Knowledge about Diarrhoea

Most women were well-aware of the major signs/symptoms (watery bloody stools, sunken eyes and sunken fontanelle) of diarrhoea; similar to findings from a previous study in Khayelitsha.[20]

On unprompted aetiology, interviewees were more likely to mention dirt and dirty/unhealthy food than germs. However, germs were perceived as one of the major causes of diarrhoea on prompted aetiology; suggesting that these respondents have been exposed to some health education on diarrhoea. Not having a toilet and breathing in bad smells were also perceived as causal agents, suggesting misconceptions on aetiology.

On unprompted transmission and prevention of diarrhoea, the most frequent responses were : consulting medical personnel, keeping oneself and surroundings clean, eating healthy food and using oral dehydration therapy. These responses tended to reflect a western medical approach to diarrhoea, and were similar to those reported for the Khayelitsha study.[20]

There were some differences between unprompted and prompted transmission and prevention, suggesting some confusion on terminology. On prompted, the majority of respondents said that diarrhoea was transmitted by rubbish and stools, insects and dirt. It was prevented by drinking clean water and keeping dishes, utensils, the house and yard clean.

In keeping with other studies on diarrhoea (eg, Lesotho, South Africa and Zimbabwe),[16,20,41] the concept of contamination is central to transmission and prevention of diarrhoea.

Women from Tembisa had lower knowledge scores than women from Ivory Park or the squatter camp. This may have been due to their age; precluding the presence of small children. However, previous research in Ivory Park[42,43] reported that the focus for clinic health education was on nutrition and hygiene; necessitated by the problem of diarrhoea in Ivory Park. Therefore, these differences may have been due to more health education on diarrhoea in Ivory Park than in Tembisa.

5.3 Personal and Domestic Hygiene

More women said that they washed their hands after going to the toilet and before eating than before preparing food, similar to findings in Khayelitsha.[20] The hygiene behaviour scale corroborated findings from the interviews, since respondents were more likely to wash their hands with soap before eating than before preparing food. The emphasis on hand washing before eating may have been due to the use of hands for eating.

Just over half of the interviewees said that they washed their hands with soap. Although women in the squatter camp were more likely to use water only when washing their hands, they were equally likely to have soap in their houses as women in Kanana and Extension 6, Ivory Park.

Soap was perceived as useful in preventing disease, and respondents felt that it was important to wash their hands with soap before drawing water, after going to the toilet, before preparing food and before eating. Yet these behaviours only occurred sometimes, demonstrating a gap between knowledge, attitudes and behaviour.[7,8] It would appear that, although most respondents had positive attitudes towards using soap, there was a lack of knowledge concerning the role of soap in prevention and transmission of disease.

Food safety was of considerable importance. Households with refrigerators stored vegetables, meat, milk and leftovers in them. Milk was used immediately and meat was cooked and eaten immediately in households without refrigerators.

6. CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 Conclusions

* An adequate water supply was not synonymous with usage.
* Residents of the squatter camp needed more taps to reduce waiting time for collecting water.
* Pit latrines were considered unsuitable for small children.
* Adequate sanitation (not overflowing, no smells) was perceived as very important by all interviewees.
* Ivory Park women were more knowledgeable about signs/symptoms, aetiology, transmission and prevention of diarrhoea than women in Tembisa or the squatter camp.
* Age, schooling, piped inside water, aqua privy/pit latrine, own dustbin and possession of a refrigerator were important determinants of knowledge about diarrhoea, attitudes towards personal and domestic hygiene and personal hygiene behaviour.

6.2 Limitations

The sample of women from Tembisa were older, less well-educated and in a higher socio-economic status (SES) bracket than women from the squatter camp and Ivory Park. It is possible that the differences found on diarrhoea knowledge, attitudes towards personal and domestic hygiene and personal hygiene behaviour were a reflection of age and schooling rather than other variables (piped inside water, own dustbin, refrigerator). Therefore, future research with these scales needs to match on age and education or control for age and education through analysis of covariance.

Future research with the knowledge about diarrhoea scale, and the personal and domestic hygiene attitudes and behaviour scales needs to ensure an equal number of reversed items to control for social desirability. Otherwise a social desirability measure should be added to these scales, and used as a covariant in the multivariate analysis.

6.3 Recommendations

Health improvements (ie, decreases in diarrhoea and eye/skin infections) can be achieved through the promotion of personal and domestic hygiene. Therefore, a comprehensive South African hygiene education programme for water and sanitation is essential.

Teachers, nurses, water and sanitation engineers, community health workers, environmental health officers and agricultural extension officers need to be trained to implement such a programme. This programme can be initiated in the schools, at clinics, in the media (radio, television) and in the community. The programme requires tailoring to suit particular target audiences. For example, young women with children will be more concerned about diarrhoea than older women without young children.

The following aspects of such a programme can include :

* The advantages of using a minimum of 25 litres of water per person per day.

* The reasons for regular cleansing of plastic drums before using them for storage and conveyance.

* The method of construction and the need for regular inspection of pit latrines.

* The requirements for VIP/Pit Latrines/Aqua Privies to operate effectively and the consequences of using disinfectants in pit latrines or septic tanks.

* How to encourage small children to use chamber pots and toilets (steps and baby toilet seat).

* The relationship between faeces and faeco-oral diseases, and the methods of safe disposal for faeces.

* The promotion of washing hands with soap after visits to the toilet, after cleaning babies, and before eating and preparing food.

* The role of soap, and personal and domestic hygiene in the prevention and transmission of illness/disease.

* The advantages of drying hands on clean cloths.

* The advantages of using oral dehydration therapy for the treatment of diarrhoea in children.

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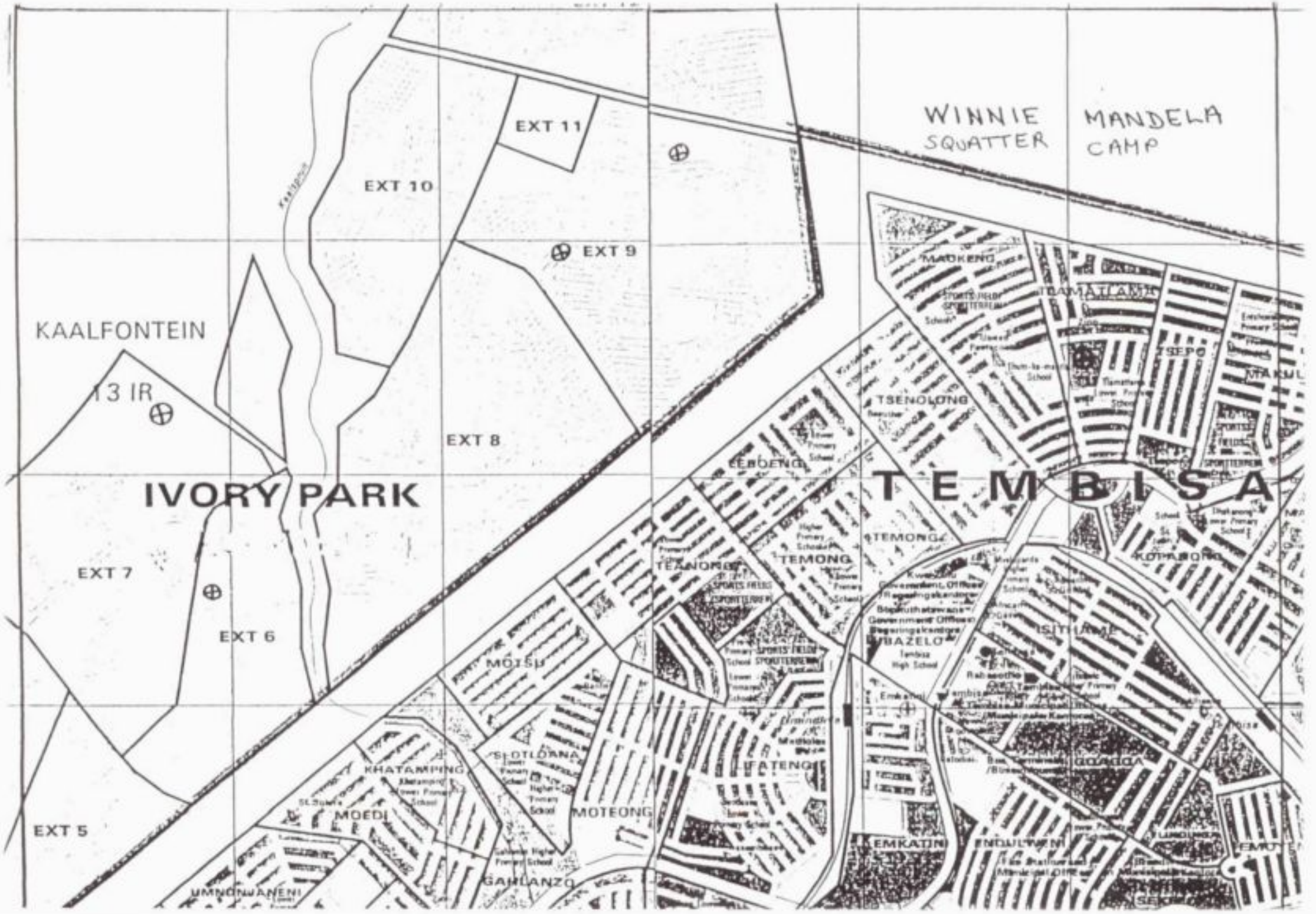
APPENDIX A

Map of Ivory Park and Tembisa


WINNIE MANDELA
SQUATTER CAMP
EXT 11
EXT 10
EXT 9
KAALFONTEIN
13 IR
EXT 8
IVORY PARK
EXT 7
EXT 6
EXT 5
TEMBISA
MADIBENG
TSENOLONG
TEMONG
KOPANONG
BAZELO
MOTSU
KHATAMPING
MOEDI
MOTEONG
LEFATENG
GOADA
EMKATINI
GAHLANZO
UMNONWANENI

APPENDIX B

Interview Schedule and
Observation Checklist

Ivory Park Personal and Environmental Health and Hygiene Study

Address of stand _____

Record the date and time when you visited the stand and how long you were there

_____

_____

My name is _____ and I am working for the Medical Research Council. We are conducting a study to find out how people feel about personal and environmental health and hygiene.

The information you give will be treated as strictly confidential. Your participation is entirely voluntary and you may refuse to participate at any stage of the interview.

The results of this survey will be presented to the Community and will also assist in providing appropriate health and hygiene education programmes for your community.

Are you willing to participate in this study?

Y	N

INTERVIEW SCHEDULE

DEMOGRAPHIC DATA

Name of respondent _____

Respondent's address _____

Sex _____

Age (date of birth) _____

Highest standard passed _____

Marital status _____

Occupation (what work - self-employed as what)? _____

Language preference _____

Status in household _____

Head of household _____

Number of persons over 20 years in household? _____

Number of persons aged 13-20 years? _____

Number of children aged 6-12 years? _____

Number of children under 6 years? _____

WATER SUPPLY AND STORAGE

Where do you get your water from and how far away is it?

_____

_____

_____

What kind of container do you put it in and how do you carry it back?

_____

_____

_____

How much water do you collect at one time? _____

How often do you collect water in a day? _____

Where do you put your water in the house and how do you store it? _____

_____

How often do you clean the container? _____

What do you clean the container with? _____

What do you pay for water? _____

What do you use the water for? _____

_____

_____

_____

Do you re-use water for what reason? _____

_____

_____

_____

_____

Where does the grey water from washing go? _____

_____

SANITATION

How many toilets are there on the stand? _____

How many are working toilets? _____

Where do you go to the toilet and how far away is it? _____

_____

_____

What kind of a toilet is it? _____

Who else uses this toilet? (probe) _____

_____

_____

Do small children use this toilet? _____

_____

If not, where do small children go to the toilet? _____

_____

_____

_____

Where is small children's waste put? _____

Who cleans children after they have gone to the toilet? _____

_____

What do you use to clean yourself after going to the toilet? _____

_____

Who cleans the toilet? _____

What does the person use to clean the toilet? _____

_____

Do you have any problems with the toilet? _____

_____

If yes, what kind of problems and how do you sort them out? _____

_____

_____

_____

How do you store waste before taking it outside? _____

_____

_____

How do you store waste outside your home? _____

_____

_____

How often is waste collected? _____

_____

Do you have flies in your kitchen during the day? _____

Do you have flies in your toilet during the day? _____

What do you do when you have flies? _____

_____

How and where do you store?

Raw vegetables _____

Raw meat _____

Leftovers _____

Milk _____

What fuel do you use for lighting? _____

_____

What fuel do you use for cooking? _____

_____

When do you wash your hands? _____

_____

_____

What do you wash your hands with? _____

_____

Why do you wash your hands? _____

_____

_____

What do you use to dry your hands? _____

_____

_____

What do other members of the family use to?

Wash their hands _____

_____

Dry their hands _____

_____

How often do you bath children in a week? _____

What do you use for washing dishes? _____

_____

_____

What do you use for drying dishes? _____

_____

_____

What do you think causes diarrhoea? _____

_____

_____

How do you think diarrhoea can be prevented? _____

_____

_____

How can you stop diarrhoea from spreading? _____

_____

_____

What do you think causes eye/skin infections? _____

_____

How can you prevent eye/skin infections? _____

_____

_____

How can you stop eye/skin infections from spreading? _____

_____

Do you believe that soap can prevent disease infection?

Y	N

If yes, why and how does soap prevent disease/infection? _____

_____

_____

_____

OBSERVATION CHECKLIST

Housing

Materials used _____

Number of rooms _____

Number of sleeping rooms _____

Type of toilet _____

Type of toilet paper _____

Is there a separate kitchen?	Y	N
Is there soap?	Y	N
Is there washing powder?	Y	N
Are there animals/chickens in the kitchen?	Y	N
Any cooked food which is stored uncovered?	Y	N
TV	Y	N
Radio	Y	N
Refrigerator	Y	N
Car	Y	N
Stove	Y	N
Oven	Y	N
Alcohol	Y	N

Cleanliness of :

Living quarters	Y	N
Kitchen	Y	N
Yard	Y	N
Toilet	Y	N
Water containers	Y	N
Cups/plates/pans/cutlery	Y	N
People	Y	N
Children	Y	N
Cooking facilities	Y	N

APPENDIX C

Knowledge, Attitudes and Behaviour Questionnaire

PERSONAL AND ENVIRONMENTAL HYGIENE

KNOWLEDGE, ATTITUDES AND BEHAVIOUR

IN RELATION TO DIARRHOEA

Interviewer: Please introduce yourself and say that you are from the MRC and are conducting research on the signs/symptoms, cause, spread and prevention of diarrhoea. Ask whether the person would be willing to participate in a 10 minute interview. If she says yes, then ask the following questions.

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ID ☐☐☐ (1)

1. Interviewer _____ ☐ (4)
2. Address _____ ☐ (5)
3. Type of house _____ ☐ (6)
4. Age _____ ☐☐ (7)
5. Highest standard passed _____ ☐☐ (9)
6. Marital status _____ ☐ (11)
7. Occupation _____ ☐ (12)
8. Type of work _____ ☐☐ (13)
9. Which of the following do you have in working condition?
   - TV, ☐ (15)
   - Refrigerator, ☐ (16)
   - Stove, ☐ (17)
   - Oven, ☐ (18)
   - Radio ☐ (19)
10. Type of water supply _____ ☐ (20)
11. Type of toilet _____ ☐ (21)
12. Type of waste storage _____ ☐ (22)

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13. The signs/symptoms of diarrhoea are:

		Y	N	DK	
a	Hard stools	1	2	3	☐(23)
b	Watery bloody stools	1	2	3	☐(24)
c	Gaining weight	1	2	3	☐(25)
d	No abdominal pains	1	2	3	☐(26)
e	Sunken eyes	1	2	3	☐(27)
f	Wrinkled skin	1	2	3	☐(28)
g	Good appetite	1	2	3	☐(29)
h	Dizziness	1	2	3	☐(30)
i	Fever	1	2	3	☐(31)
j	Sunken fontanelle	1	2	3	☐(32)

14. Diarrhoea is caused by:

		Y	N	DK	
a	Germs	1	2	3	☐(33)
b	Undercooked meat	1	2	3	☐(34)
c	Raw fish	1	2	3	☐(35)
d	Reheated cooked food	1	2	3	☐(36)
e	Children eating earth	1	2	3	☐(37)
f	Dirty water	1	2	3	☐(38)
g	Dirty food	1	2	3	☐(39)
h	No toilet	1	2	3	☐(40)
i	Breathing in bad smells	1	2	3	☐(41)
j	Dirty dishes/utensils	1	2	3	☐(42)

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15. Diarrhoea is spread by:

		Y	N	DK	
a	Rubbish and stools around the home	1	2	3	☐(43)
b	Children's stools	1	2	3	☐(44)
c	Water	1	2	3	☐(45)
d	Flies/cockroaches/insects	1	2	3	☐(46)
e	Dirty hands	1	2	3	☐(47)
f	Dirty eating utensils/dishes	1	2	3	☐(48)
g	Stools on hands	1	2	3	☐(49)
h	Dirty water containers	1	2	3	☐(50)
i	Dirty rags to dry hands	1	2	3	☐(51)
j	Dirty toilets	1	2	3	☐(52)

16. Diarrhoea is prevented by:

		Y	N	DK	
a	Washing hands with soap	1	2	3	☐(53)
b	Using a clean rag to dry hands	1	2	3	☐(54)
c	Keeping food covered	1	2	3	☐(55)
d	Drinking clean water	1	2	3	☐(56)
e	Keeping water containers covered	1	2	3	☐(57)
f	Keeping dishes/utensils clean	1	2	3	☐(58)
g	Eating only fresh food	1	2	3	☐(59)
h	Cleaning toilets	1	2	3	☐(60)
i	Proper disposal of children's stools	1	2	3	☐(61)
j	Washing child's bottom and hands after defecation	1	2	3	☐(62)
k	Cleaning water containers with soap	1	2	3	☐(63)
l	Stopping children eating earth	1	2	3	☐(64)
m	Keeping the house and yard clean	1	2	3	☐(65)
n	Covering garbage	1	2	3	☐(66)
o	Washing bodies daily	1	2	3	☐(67)

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17. How important is it to you to:

		VI	I	U	VU	
a	Wash your hands with soap: after going to the toilet	1	2	3	4	☐(68)
b	before preparing food	1	2	3	4	☐(69)
c	before eating	1	2	3	4	☐(70)
d	before drawing water	1	2	3	4	☐(71)
e	wash fruit and vegetables	1	2	3	4	☐(72)
f	cover food	1	2	3	4	☐(73)
g	kills flies/cockroaches/insects	1	2	3	4	☐(74)
h	clean eating utensils/dishes	1	2	3	4	☐(75)
i	cover garbage	1	2	3	4	☐(76)
j	cover and clean the water container	1	2	3	4	☐(77)

18. Do you

		Al	Oft	Some	Nev	
a	Wash your hands with soap: after urinating	1	2	3	4	☐(78)
b	after defecating	1	2	3	4	☐(79)
c	before eating	1	2	3	4	☐(80)
d	before preparing food	1	2	3	4	☐(81)
e	after disposing of children's stools	1	2	3	4	☐(82)
f	after cleaning children's bottoms	1	2	3	4	☐(83)
g	wash your body daily	1	2	3	4	☐(84)
h	cover food	1	2	3	4	☐(85)
i	clean eating utensils/dishes	1	2	3	4	☐(86)
j	cover the water container	1	2	3	4	☐(87)

APPENDIX D

Fig 1. Collection of drinking water in Extension 6, Ivory Park

Fig 2. Washing in Kanana

Fig 3. Queuing up for water - residents of Winnie Mandela

Fig 4. A home-made pit latrine in Winnie Mandela

Fig 5. An aqua privy in Ivory Park

Fig 6. Housing in Ivory park

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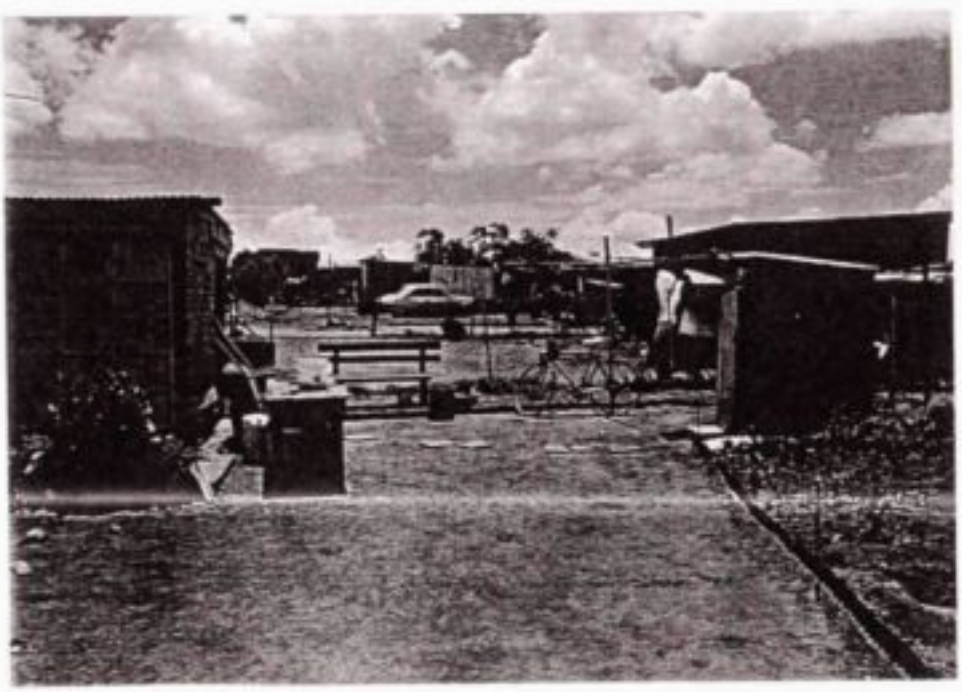

Fig 6. Housing in Ivory Park