

# **THE EFFECT OF DISTANCE FROM CLINICS ON MATERNAL AND CHILD HEALTH (MCH) SERVICE UTILIZATION AND MCH STATUS**

By

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## **ABSTRACT**

There is strong evidence from developing countries to support the hypothesis that physical accessibility of health services, particularly absolute distance from clinics, is a major determinant of health service utilization and health status. In South Africa, such evidence is very limited and as a result the relationship between absolute distance and health service utilization and health status is not fully understood. As an attempt to understand this relationship, a household survey of mothers with children aged 12-23 months was conducted in a rural district of KwaZulu-Natal province, South Africa. Maternal and child health (MCH) service utilisation and MCH status patterns were then compared at different absolute distances from PHC clinics. The findings reveal that the study population is characterised by impoverished living conditions (86%), high functional illiteracy (67%), high fertility and unemployment rates. In comparison with other studies conducted previously in the same population, MCH service utilization rates are high. Based on mean distances of homesteads from PHC clinics in the entire study area before the Clinic Upgrading and Building Programme it has been concluded that the physical accessibility of fixed PHC clinics, when compared with the WHO recommendations, was suboptimal. When this assessment is based on clinic usage patterns, it is found that clinic usage decreased from 86.4% at 0-5 km to 79% at 6-10 km with a dramatic decrease to 37.8% at distances beyond 10 km. This decrease in usage at distances above 5 km translates into a considerable reduction in effective coverage of the target population by PHC clinic services if it is considered that above 50% of the population live greater than 5 km from these clinics.

An assessment of the effect of distance of homesteads from PHC clinics on specific MCH service utilization and MCH status has found very few or no significant differences between mothers and children living at 0-5 km, 6-10 km or >10 km from these clinics. This observation is consistent even after adjustment for the effects of potential confounding. The fact that distance from clinics has little or no effect on the indicators of MCH service utilization and MCH status is counter-intuitive. A few explanations can be provided. These include the fact that only 50% of the population, even in one of the most rural parts of South Africa access clinics on foot. Since the traditional assumption has been that this distance effect is a function of straight-line walking distances between homesteads and clinics, Euclidian distances alone may be a poor explanatory variable for health service utilization.

Furthermore, if the hypothesis is valid that health status is a function of service utilization, it may also be a poor explanatory variable for health status of community members who are reliant on these services. Secondly, based on data from other sources, there is evidence that there have been steady declines in both mortality and fertility rates in the study population over the past 10-20 years suggesting that client communities are already benefiting quite substantially from health services in general and from MCH services in particular in spite of residual distance barriers. In other words, this distance effect on service utilization and health status may be more evident in populations with much higher background infant, child and maternal mortality rates. Thirdly, it is also possible that distance effect still exists, but that methodological limitations prevented this study from showing this effect. For instance, the fact that people use mobile clinics for some MCH services may have confounded the effect of distance from fixed clinics. It is also possible that people use different facilities for different services even though they are further away, and the assumption that all facilities have equal attraction for clients and that the only determinant of use is distance may be flawed. For example, it is evident from this and from other studies in South Africa that whereas most clients use fixed clinics for vaccinations, deliveries are now increasingly conducted at hospitals. Other methodological issues include the fact that certain health outcomes such as stunting are not an exclusive reflection of health service inputs, but are a function of social and economic determinants. Based on these findings, a number of recommendations are made.

## PREFACE

This study represents original work by the researcher and has not otherwise been submitted in part or whole for any degree or diploma to any other university. Where the researcher used work of others it is duly acknowledged in the text.

The fieldwork described in this thesis was carried out in Umkhanyakude District, KwaZulu-Natal province, South Africa. The GIS analysis was undertaken in the GIS laboratory of the Malaria Research Programme, Medical Research Council, Durban, in collaboration with the School of Life and Environmental Sciences, University of Natal, Durban. The study was conducted from August 1996 to January 2000 under the supervision of Dr Dianne Scott and co-supervision of Professor Geoff C Solarsh (University of Natal).



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## LIST OF ACRONYMS

<b>ARR</b>	Adjusted Risk Ratio
<b>AIDS</b>	Acquired Immuno-Deficiency Syndrome
<b>ANC</b>	Antenatal Clinic
<b>BCG</b>	Bacillus Calmette-Guerin
<b>CHF</b>	Community Health Facilitator
<b>CHW</b>	Community Health Worker
<b>CPHC</b>	Comprehensive Primary Health Care
<b>CUBP</b>	Clinic Upgrading And Building Programme
<b>CRR</b>	Crude Risk Ratio
<b>DHS</b>	District Health System
<b>DNHPD</b>	Department of National Health And Population Development
<b>DPT</b>	Diphtheria, Tetanus and Pertussis ( <i>Bordetella pertussis</i> ) vaccine
<b>GIS</b>	Geographic Information Systems
<b>GOBI-FFF</b>	Growth Monitoring, Oral Rehydration Therapy, Breastfeeding, Immunisation, Female Education, Feeding And Family Spacing
<b>GP</b>	General Practitioner
<b>GPS</b>	Global Positioning System
<b>HAZ</b>	Height For Age Z-scores
<b>HepB</b>	Hepatitis B
<b>HFA</b>	Height For Age
<b>HIV</b>	Human Immuno-Deficiency Virus
<b>HST</b>	Health Systems Trust
<b>IMCI</b>	Integrated Management of Childhood Illnesses
<b>IMR</b>	Infant Mortality Rate
<b>LBW</b>	Low Birth Weight
<b>MCH</b>	Maternal And Child Health
<b>MWH</b>	Maternity Waiting Homes
<b>MCWH</b>	Maternal, Child And Women's Health
<b>MIS</b>	Malaria Information System
<b>MRC</b>	Medical Research Council
<b>NHS</b>	National Health Service

<b>ORS</b>	Oral Rehydration Solution
<b>ORT</b>	Oral Rehydration Therapy
<b>PHC</b>	Primary Health Care
<b>RDP</b>	Reconstruction And Development Programme
<b>RR</b>	Risk Ratio
<b>RTHC</b>	Road To Health Card
<b>RTI</b>	Respiratory Tract Infections
<b>SMI</b>	Safe Motherhood Initiative
<b>SADHS</b>	South African Demographic and Health Survey
<b>SAVACG</b>	South African Vitamin A Consultative Group
<b>SSS</b>	Sugar Salt Solution
<b>STD</b>	Sexually Transmitted Disease
<b>TB</b>	Tuberculosis
<b>UNICEF</b>	United Nations Children Fund
<b>UNSD</b>	United Nations Statistics Division
<b>WAZ</b>	Weight For Age Z-scores
<b>WFA</b>	Weight For Age
<b>WFH</b>	Weight For Height
<b>WHO</b>	World Health Organization
<b>WHZ</b>	Weight For Height Z-scores

## LIST OF DEFINITIONS

### **Absolute distance**

Straight-line distance between two points

### **Absolute space**

A relation defined on a set of objects located within a bounded entity

### **Accessibility**

Ability of a population to have a health service within reasonable reach

### **Birth interval/birth spacing**

Time interval between the birth between two consecutive children (recommended average birth interval is 2 years or more).

### **Comprehensive primary health care (CPHC)**

PHC that includes a wide spectrum of health care services and activities that involve inputs by both the community and health providers.

### **Distance buffers**

Boundaries created around points, lines or areas at an equal distance in all directions resulting in a circular, corridor or polygon shaped features or catchments.

### **District health system**

Is a more or less self-contained segment of the national health system, comprising a well-defined population of between 50 000 and 75 000, living within a clearly delineated administrative and geographical area, whether urban or rural. It includes all institutions and individuals providing health care in the district, whether governmental, social security, non-governmental, private, or traditional district hospital.

### **Early Neonatal deaths**

Deaths in the first seven days of life.

### **Fully vaccinated children**

Children who have received the full course of BCG, four doses of polio, DPT, HepB and one dose of measles vaccines during the first year of life.

### **GIS**

An information management technology, made up of a set of software tools designed for collecting, storing, retrieving, transforming, displaying and disseminating spatial as well as attribute data.

### **Gravidity**

The number of times a woman has been pregnant irrespective of duration or outcome.

### **Health service utilization**

In the context of this thesis, evidence that access to health has been achieved and distance overcome.



**Infant deaths**

The number of deaths occurring in the first year of life and usually expressed as a rate per 1000 live births in the same period.

**Late neonatal deaths**

Deaths between 8-28 days of life.

**Low birth weight (LBW)**

Children with a birth weight of less than 2.5 kg.

**Manhattan space**

A space in which the shortest distance between two points is a path consisting of line segments, which meet at right angles, i.e. distance between two points is measured from roads, which travel around blocks of buildings.

**Neonatal deaths**

Deaths in the first 28 days of life, which are usually divided into early neonatal and late neonatal deaths

**Oral rehydration therapy**

Fluid replacement solution used to treat diarrhoea, made from home preparations by mixing one litre of boiled water, eight teaspoons of sugar and one teaspoon of salt (sugar, salt solution). Diarrhoea can also be treated by mixing one litre of boiled water with a packet of oral rehydration solution (ORS) obtained from clinics.

**Parity**

The number of times a woman has given birth to a viable infant (after 28 weeks gestation) irrespective of outcome. This includes stillbirths and counts twin births separately.

**Perinatal deaths**

Deaths occurring between 28 weeks gestation and through the first seven days of life. Includes stillbirths and neonatal deaths.

**Physical space**

A relation defined on the physical realities of the material world

**Polygon**

Is defined by the lines that make up its boundary and a point inside its boundary for identification and have attributes that describe the geographic feature they represent.

**Post-neonatal deaths**

Deaths between 28 days and 1 year of age.

**Primary health care (PHC)**

Essential health care based on practical, scientifically sound and socially acceptable methods and technology, universally accessible to individuals and families in the community, at a cost that the community and the country can afford.

**Primary level of care**

Level of care whereby the health service facilities are staffed by generalists that are open to self-referral and through which a patient makes first contact with health care system.

This type of care is provided at the PHC clinics, general practitioners offices and out-patient departments of hospitals.

**Relational space**

Interrelationships between economic, political and social rules and places, peoples and events.

**Relative space**

A system of relations of one object with respect to other objects in which physical space is defined as elliptic and not Euclidean in shape.

**Riemannian space**

The shortest distance between two points is a curved line, for example, a route around a mountain.

**Space**

Relation defined on a set of objects where each object has a location and a direction.

**Stillbirth**

Children born after 28 weeks gestation who show no signs of life at birth.

**Thiessen polygon**

A polygon bounding the region closer to a point than to any adjacent point. Polygons are drawn so that the lines are of equal distance between two adjacent points of interest, in this case the selected residential clinics.

**Vaccination coverage**

Refers to the percentage of children who have been given a vaccine against one of the vaccine-preventable diseases of childhood such as tuberculosis (BCG vaccine); poliomyelitis (3 doses of polio); diphtheria, pertussis & tetanus (3 doses of DPT), Hepatitis B virus (3 doses of HepB) and measles.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Chapter overview**

This study is concerned with the accessibility of primary health care (PHC) clinics in rural areas of South Africa. It is particularly concerned with accessibility of PHC services for mothers and children in these rural areas and the effect of accessibility or lack thereof, on maternal and child health (MCH) status. Since fixed PHC clinics are the primary and most peripheral point of access to PHC services in rural areas and since mothers and children are the most common users of these services, an assessment of clinic utilization patterns and their impact on health status in these vulnerable groups provide a good proxy for the overall impact of PHC services. In spite of steady migration from rural to urban areas over the past two decades, the majority of South Africa's population continues to live in rural areas (Statistics South Africa, 1996). These areas also continue to have the highest levels of underdevelopment due to the legacy of the Apartheid system. For these reasons, the purpose of this study is to determine the impact of accessibility on MCH service utilization and MCH status in rural areas.

Chapter 1 presents the background on MCH services and PHC facilities. The emphasis is placed on rural areas. The first section of chapter 1 provides essential background and context about the South African health care system prior to the political transformation process initiated in 1994. The effects of the Apartheid system on MCH service utilization and MCH status are discussed in the context of urban-rural differentials.

Section one of this chapter concludes with an insight into the post-1994 health sector reform process. The second section provides a rationale for the study. The final discussion includes the sections on the research question, research hypothesis, aim, objectives, research framework and the structure of the thesis.

## **1.2 Background and context**

This section provides a brief overview of the South African health system under the Apartheid system in terms of its structure and its effects on MCH service utilization and MCH status of rural communities.

### **1.2.1 The structure of the South African health system under the Apartheid system**

The Apartheid system required the creation of separate health authorities for each of the non-independent governments of KwaZulu, Lebowa, Kangwane and Gazankulu; the independent states of the Transkei, Bophuthatswana, Venda and Ciskei and for each of the other population groups, namely Whites (House of Assembly) Coloureds (House of Representatives) and Indians (House of Delegates). In addition, there were separate local health authorities for each of the large metropolitan areas and other smaller towns and villages and a dedicated health department to handle black populations that fell outside designated black homelands. This arrangement resulted in 14 different health departments, with separate authorities and health budgets without a unitary policy for the distribution of health resources. The existence of all these different health departments with substantial autonomy and separate policies made it very difficult to implement a set of priority national health programmes.

The few identified vertical programmes were therefore mainly implemented through local authority clinics in the large metropolitan areas. These clinics provided specialized and exclusive services in the areas of family planning, sexually transmitted diseases, TB, mental health etc. These clinics were not able to offer more comprehensive health services for all users. This was clearly not an efficient use of these facilities as this resulted in duplication, mismanagement and wastage of resources and inadequate planning (van Rensburg, *et al.*, 1992).

The resources provided for the running of these services were inequitably distributed and separately administered for the different population groups. For example, the Department of National Health and Population Development (DNHPD) allocated and distributed health expenditure unfairly between the provinces and races. Gauteng and Western Cape provinces received a large portion of the health budget, while the other provinces received less. The respective per capita health expenditure was R381.66 and R491.13 for Gauteng and Western Cape provinces. In other provinces this expenditure ranged from R136.60 in Mpumalanga to R266 in the Eastern Cape (McIntyre *et al.*, 1995).

The majority of the national health expenditure occurred in the private sector, which served the minority of the population and predominantly those people based in urban areas. Since the provinces with the lowest budget allocation and national health expenditure were largely rural in nature, MCH service utilization and MCH status in these provinces remained poor. The distribution of health services between urban and rural areas meant that the majority of the African rural populations were dependent on public health services. However, these public health services were also not accessible to these populations because there was a shortage of health care facilities and health personnel in rural areas.

The few rural hospitals had a shortage of beds, which fell far short of the World Health Organization (WHO) recommendation of 200 patients per bed. Furthermore, the 2 548 PHC clinics that existed in South Africa in 1993 translated into 15 979 people per clinic. This ratio exceeded the WHO recommendation of 10 000 people per clinic. Again, the ratio was higher in the largely rural provinces of KwaZulu-Natal, Limpopo, Eastern Cape and Mpumalanga. These provinces clearly needed more PHC clinics (Chetty, 1995).

A shortage of health personnel in rural areas was due to the fact that a higher proportion of the health personnel except for nurses, were located in the private sector and was based in urban areas. Most general practitioners (GPs) were not prepared to work in rural areas and this led to a 1:4 100 ratio of GP per population in rural areas compared to 1:900 in urban areas (Makan & Bachmann, 1994). This shortage of health personnel in the public health sector in rural areas contributed to the problem of accessibility of public health services. Accessibility of public health services was also affected by the socio-economic status of the populations. The poor, unemployed and illiterate people in rural areas who lived in overcrowded conditions could not afford fees for health services. Transportation cost was another problem faced by these rural communities thus making even public health services less accessible.

Although urban-rural differentials exist in every country, in South Africa rural disadvantage has been very significantly exacerbated by the Apartheid system. The living conditions of many rural communities and the inadequate planning, lack of implementation, supervision, monitoring and evaluation of health services resulted in less efficient and less accessible public health services (Health Systems Trust, 1995; Hirschowitz *et al.*, 1995; Yach & Harrison, 1995). These conditions resulted in different patterns of health service utilization and health status according to population group, geographical region and socio-economic status.



These problems indicated that the rural communities particularly mothers and young children, were the most vulnerable in terms of lack of health services. For these reasons, the discussion presented in the following sections will mainly focus on mothers and young children, who are the main subjects of this study and are the major consumers of PHC services in South Africa. The effects of the Apartheid system, which resulted in less accessible health services, are presented in terms of the indicators of MCH service utilization and MCH status with emphasis on rural areas.

### **1.2.2 Urban-rural differentials in child health service utilization**

Commonly used indicators of child health service utilization include possession of a Road to Health Card (RTHC) and documented vaccination coverage. The RTHC is an important source of information about growth monitoring, the type, number and date of vaccinations received and the date for next vaccination. Vaccination coverage refers to the percentage of children who have been given a vaccine against one of the vaccine-preventable diseases of childhood such as tuberculosis (BCG vaccine); poliomyelitis (3 doses of polio); diphtheria, pertussis & tetanus (3 doses of DPT), Hepatitis B virus (3 doses of HepB) and measles. If a child has received all the above vaccines, she/he is regarded as being fully vaccinated. Since the survey, vaccination against *Haemophilus Influenza* infection has been added to the schedule.

Previous vaccination coverage surveys conducted in South Africa such as the study by the South African Vitamin A Consultative Group (SAVACG) and the South African Demographic and Health Survey (SADHS) have shown that both possession of a RTHC and vaccination coverage in children 12-23 months were consistently lower in rural areas than in urban areas (SADHS, 1998; SAVACG, 1995).

The SAVACG survey reported that possession of a RTHC was documented for 88.6% of the population in rural areas compared to 94.9% in urban areas. The corresponding figures reported by the SADHS were 73.8% for rural areas and 75.3% for urban areas. The DNHPD (1990) reported lower levels of vaccination coverage for the individual vaccines in rural than in urban areas. For example, vaccination against measles in children 12-23 months was 57% in rural areas but 71% in urban areas. The SAVACG survey (1995) reported that 58% of children 12-23 months in rural areas had been fully vaccinated compared with 70.9% of their urban counterparts. The figures reported by the SADHS (1998) for fully vaccinated children were 59.6% in rural areas and 67.1% in urban areas. The urban-rural differentials have also been observed in terms of maternal health service utilization.

### **1.2.3 Urban-rural differentials in maternal health service utilization**

Indicators used to measure maternal health service utilization include antenatal clinic (ANC) attendance, supervised delivery by a trained health worker, attendance at postnatal care and family planning service utilization. ANC attendance is an important indicator for monitoring health of the mother and the unborn child in pregnancy and also helps to predict pregnancy complications that may arise at delivery. Delivery of a baby at a health facility attended by a health professional is important for the survival of both the baby and the mother.

Key causes of mortality in these settings are antepartum and postpartum haemorrhage, puerperal sepsis and obstructed labour in the case of the mother and low birth weight (LBW), neonatal sepsis, perinatal asphyxia and a range of problems of adaptation to an extra-uterine environment in the case of the newborn infant. Many of these are amenable to prevention, timely interventions at the time of delivery or prompt referral

soon thereafter. Family planning service utilization helps the women to prevent unwanted pregnancies and properly space her children. This gives the women time to raise other children. Despite the known benefits of maternal health services, utilization of these services was low in rural areas during the Apartheid era. For example, Cronje *et al.* (1995) reported that in the Freestate province ANC attendance in rural women was 71% compared with 87% of the urban women. Similarly, the SADHS (1998) reported ANC attendance rates of 83.7% for rural women and 94.8% for urban women for South Africa as a whole. These results still emphasize the effects of the Apartheid system on the MCH service utilization in rural areas.

The patterns for delivery service utilization are similar to those for ANC attendance. Only a few deliveries in rural areas occurred at the health facilities. In the study conducted in the Freestate, Cronje *et al.* (1995) reported that 60% of rural women delivered their babies at home compared to 23% of urban women. Jinabhai *et al.* (1994) and O'Mahony & Steinberg (1995) reported similar findings in KwaZulu-Natal and the Eastern Cape provinces respectively. The SADHS (1998) reported lower numbers of home deliveries for South Africa, but these also reflect urban-rural differentials (24.5% rural areas and 6.6% urban areas). The same survey reported family planning service utilization rates for South Africa of 53.9% in rural areas and 66.8% in urban areas. These results further suggest that MCH services are less accessible to rural communities. These urban-rural differentials were also apparent in MCH status.

#### **1.2.4 Urban-rural differentials in MCH status**

Health service utilization trends are often associated with parallel trends in health status (WHO, 1981). Although the relationship between these two variables is very complex, there is reason to expect that low levels of health service utilization would result in poor health status.

Health status indicators that are commonly used for mothers and children in developing countries include, maternal, infant, child and under-5 mortality rates, LBW rates, anthropometrical status of preschool children and prevalence rates for vaccine-preventable diseases, diarrhoea and respiratory tract infections (RTI). Neonatal and post-neonatal mortality together make up infant mortality, while child mortality and infant mortality together make up under-5 mortality rates (see List of Definitions).

Maternal mortality, perinatal mortality and neonatal mortality (especially early neonatal mortality rates) reflect quite closely the use and quality of antenatal, delivery and postnatal services. Post-neonatal mortality mainly reflects events after the neonatal period and therefore is a good measure of social and environmental conditions and health services after birth (see List of Definitions). Infant mortality is affected by both availability of maternity services and social, environmental conditions and health services after birth. Therefore, neonatal and post-neonatal mortality rates are good indicators of maternal care and conditions and infant care and conditions respectively.

Although mortality rates for South Africa as a whole appear have declined in the past 10 years, urban-rural differentials still persist. Data from the SADHS (1998) showed that neonatal mortality rate for rural areas was 22/1 000 live births while in urban areas this was 16.4/1 000 live births. The corresponding post-neonatal mortality rate was 30.1/1 000 live births for rural areas and 16.2/1 000 live births for urban areas. The SADHS report also showed urban-rural differentials in infant mortality rates, child mortality rates and under-five mortality rates. Perinatal conditions, LBW and diarrhoeal conditions were rated first and second among the top 10 causes of infant and neonatal deaths in South Africa in 1995 (Bradshaw *et al.* 2000). These conditions were more severe in rural than in urban children. For example, the percentage of children with diarrhoea was reported to be 15.7% in rural areas and 10.8% in urban areas (SADHS, 1998).

According to the National Food Consumption Survey, 23% of children aged 1-6 years in South Africa, are affected by stunting and this is more prevalent in rural areas than in urban areas (SAVACG, 1995; Labadarios *et al.*, 2000). The data presented in this section indicate urban-rural differentials in MCH service utilization and MCH status. Although the data reported by the recent surveys show improvement in MCH status compared to those reported during the Apartheid era, these data suggest that urban-rural differentials still exist. These differentials are considered to be, at least partially, a consequence of access and utilization of health services.

Although the MCH status indicators discussed above are important, it is unfortunate that it was not possible to measure these indicators in this study because their measurement requires a larger sample size than could be achieved with resources allocated for this study. In order to improve MCH status, quality MCH services are required. However, it was not possible to provide these services without addressing the problems of fragmentation of health services and inequalities in health service provision that has been inherited from the Apartheid system. Major challenges faced the South African government and the national Department of Health to redress these imbalances in the post-1994 period.

#### **1.2.5 The transformation of the South African health system**

After the first democratic elections in 1994 the South African health system was restructured from a system that was largely curative, urban-based and fragmented, to a unitary National Health System (NHS) based on comprehensive PHC principles. The PHC services included promotive, preventive, rehabilitative and curative care. All these services were incorporated into a decentralized district health system (DHS) model to ensure equitable cost-effective, accessible and appropriate delivery of health services to the entire South African population (African National Congress, 1994; Department of

Health, 1996; 1997; 1998). Health districts provide well-defined geographical areas, within which all PHC services involving all sectors and health providers can be effectively integrated and organized (WHO, 1978). The DHS is the vehicle for the implementation of PHC services at the third tier of the health service through health service facilities such as fixed clinics, GP offices and outpatient departments of district hospitals. These facilities are staffed by generalists, are open for self-referral and are the points through which the patient makes first contact with the health care system (WHO, 1978). The fixed clinic is the most basic health facility and primary point of contact for PHC in a rural district (Solarsh, 1998).

To increase access to clinic services, the South African government has established an extensive Clinic Upgrading and Building Programme (CUBP). Through this national programme the number of functional clinics in South Africa has been increased from 2 548 in 1995 to 3 090 fixed clinics (van Rensburg *et al.*, 2000). Of these clinics, 139 were built and 14 renovated in KwaZulu-Natal province and 16 additional clinics have been provided in the study area. All PHC services were to be provided by these fixed clinics with a special emphasis on MCH services. Therefore, the new national health plan included these goals:

- to ensure access to high quality antenatal and postnatal care and quality care during and after delivery to mothers and their babies
- to enable each child to reach his/her maximum potential within the resources available, and to enable as many children as possible to reach adulthood with their potential uncompromised by illness, disability, environmental hazard or unhealthy lifestyle.

To achieve these goals, the Maternal, Child and Women's Health (MCWH) Committee of the national Department of Health set objectives, targets and indicators for MCH for the years 1998 and 2000.

In order to reduce maternal mortality, the government planned to increase the proportion of pregnant women receiving antenatal care to 70% in 1998 and to 100% in 2000. The proportion of deliveries in health facilities was to be increased to 50% and 75% for the same years. Utilization of family planning was to be increased to 70% in 1998 and 85% in 2000. To reduce morbidity from vaccine-preventable diseases, vaccination coverage for each vaccine was to be increased to 90% (Department of Health, 1995a). As this study was conducted during the transformation of health services in South Africa, the study also provides useful data on indicators of MCH service utilization and health status patterns during this period.

### **1.3 Problem statement**

One of the priorities of the NHS is to provide better access to mothers and children less than five years of age while improving the quality of service provided. A primary goal of the government is to reduce infant, child, maternal morbidity and mortality. This particular group is given priority in the national health plan because:

- Pregnant women and young children represent the most vulnerable groups in any community (UNICEF & NCRC, 1993; Williams *et al.* 1994).
- In any country, giving priority to the health of children and women is an important investment in the future health of its population (Department of Health, 1995a; 1997; UNICEF & NCRC, 1993; WHO/UNICEF, 1989; World Bank, 1996).
- Many conditions that affect pregnant women and young children are preventable through relatively simple and low cost interventions (Bradshaw & Buthelezi, 1996; Health Systems Trust, 1995; SAVACG, 1995; Thaddeus & Maine, 1994; Williams *et al.* 1994).



- Women and children are responsible for a large proportion of attendances at first level health facilities, particularly in rural South Africa where many men are not present as a result of the migrant labour system.

For these reasons, the reduction of maternal and child mortality has been the focus of current health in South Africa and have been the focus of major global strategies over the past 30 years. These latter include child survival strategies (GOBI-FFF) since the mid 1960's and the Safe Motherhood Initiative (SMI) since 1987 (Department of Health, 1995b; WHO/UNICEF, 1986). More recently the Integrated Management of Childhood Illnesses (IMCI), based in PHC facilities attempts to integrate syndromic approaches to the clinical management of the most important causes of mortality and morbidity in childhood with strategies for health promotion and disease prevention. This strategy, based largely at nurse-run fixed clinics, is a priority programme of the MCWH directorate in South Africa. It reinforces the importance of women and children as targets for health care delivery in PHC facilities.

One of the goals of the restructuring process in the NHS has been to provide better access to health care services for all the people of South Africa and particularly in rural areas. While this will certainly reduce distances for under-served populations to health facilities, physical distance is not the only determinant of health service utilization. Factors such as socio-economic status, educational levels (Airey, 1992; Hays *et al.*, 1990), social and cultural attitudes (Hays *et al.*, 1990) and quality of health services (Gilson *et al.*, 1995) have also been identified as important. While acknowledging the importance of these factors, this study pays particular attention to the issue of physical accessibility for the following reasons:

- Accessibility in terms of physical distance still provides the simplest basis for the macro planning of health service facilities and is traditionally used as the primary



consideration when new facilities are sited (Joseph & Phillips, 1984; King, 1966; Phillips, 1990; WHO, 1981).

- Although the influence of distance on health service utilization has been extensively studied and well documented, particularly in developing countries, very little is known in South Africa about the influence of physical distance on health service utilization patterns and the extent to which utilization decreases with increasing distance from a health facility (Chayovan, 1984; Freeman *et al.*, 1983; Joseph & Phillips, 1984; Muller *et al.*, 1998; Rahaman *et al.*, 1982; Schellenberg *et al.*, 1998; Shannon, 1969; Stock, 1983; Thaddeus & Maine, 1994).
- It seems possible that in a middle-income country like South Africa, health service utilization patterns may be significantly influenced by a greater availability of transport, high levels of migration and movement both within and between different health districts, and, therefore, by a greater capacity of client populations to exercise preference for services other than those nearest to their homes.
- There is the possibility that health service utilization patterns may change as the incidence and prevalence of the more common causes of morbidity and mortality in mothers and young children are reduced, as is presently the case in South Africa (SADHS, 1998; WHO, 1998).
- It is not clear whether improved physical access to, and, by implication, improved utilization of PHC services, is necessarily associated with better health outcomes for a client population.

For all these reasons, a better understanding of physical distance as a basis for health facility planning is clearly needed in South Africa at this time of demographic and health transition. It is particularly important in the light of the accelerated CUBP that forms a central thrust within the strategy for restructuring of health services in this country.

## **1.4 The research question**

What is the effect of physical distance of homesteads from fixed PHC clinics on MCH service utilization and MCH status in rural South Africa?

## **1.5 The research hypothesis**

MCH service utilization and MCH status decrease as physical distance of homesteads from fixed PHC clinics increases.

## **1.6 Aim**

To determine the effect of physical distance from PHC clinics on MCH service utilization patterns and MCH status, and to make policy recommendations about future clinic building programmes in rural South Africa.

## **1.7 Objectives**

- To determine accessibility of homesteads to PHC clinics based on physical distance to the nearest facility.
- To determine accessibility of homesteads to PHC clinics based on actual patterns of usage.
- To determine the effect of distance of homesteads from fixed PHC clinics on MCH service utilization patterns and MCH status.
- To determine factors, other than physical distance, that affects MCH service utilization patterns and MCH status.

- To measure the minimum, maximum and mean distances from PHC clinics of rural populations before and after the CUBP.

## **1.8 Research framework**

A positivistic approach to research has been adopted in this study. Within this approach the relationship between accessibility and MCH service utilization and MCH status is investigated using quantitative methods. The researcher measured physical accessibility by calculating physical distances from PHC clinics using geographical information systems (GIS) technology. This technology is based in quantitative measurements of distance and has proven useful in health facility planning in developed countries. GIS is also capable of handling large datasets and describing spatial relationships. At the time of the study, GIS in South Africa was a relatively new technology, which had not been applied to health facility planning and service provision.

The researcher used the already established GIS within the Malaria Research Programme of the Medical Research Council (MRC) in Durban. The researcher obtained data on MCH service utilization and MCH status from a household survey of rural mothers and children aged 12-23 months undertaken from 01 June to 15 August 1998 using an analytical cross-sectional design. Mothers with children aged 12-23 months form a significant proportion of health care consumers and are considered the most vulnerable group in the population. A survey was more appropriate to the research question as it is an easy and quick method of data collection, given the time and financial constraints of the study. A household survey was undertaken in order to include people who do not attend health facilities. An analytic design was chosen because of its relevance to showing relationship between study variables. The study is based on the assumption that in rural areas most people travel between their homesteads and health facilities on foot and that

wherever possible will choose the shortest distance between those two points. This assumption has traditionally formed the basis for health service planning in developing countries but may not apply uniformly to all areas in a middle-income country such as South Africa, where people are also reliant on vehicular transport. Therefore, the effects of demographic and social factors (age, sex, education, parity and transport) as determinants of accessibility were also examined where possible.

## **1.9 Structure of thesis**

This thesis is comprised of seven chapters. Chapter 1 provides an overview of the research topic, background and context, and a rationale for the study. It includes the aims and objectives and provides an organisational layout of this thesis. Chapter 2 reviews literature on subject areas that are relevant to the research question. Chapter 2 focuses particularly on the concepts and constructs of space and distance and their application to health service utilization and health status.

Chapters 3 and 4 provide a detailed description of the methodology. Chapter 3 describes the study area as context to both chapters 3 and 4, and methods and GIS techniques used to measure physical accessibility of PHC clinics. Chapter 4 describes methods and techniques used in the MCH household survey. Detailed contents of the questionnaire that was used to tease out the perceptions of the community on MCH service utilization and the resultant health status are described. Chapters 5 and 6 present and discuss the results. Chapter 5 discusses results on study subjects and their characteristics. This discussion includes MCH service utilization patterns and MCH status data from the MCH survey. Chapter 6 discusses accessibility and its effect on MCH service utilization and MCH status. Chapter 7 concludes the thesis and presents recommendations of the study.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Chapter overview**

The purpose of this chapter is to provide a conceptual framework to understand the effects of accessibility on health service utilisation and health status. Although there are many dimensions to accessibility, this discussion will focus primarily on the concept of physical accessibility to health facilities as a determinant of health service utilization. The chapter begins by defining the concepts of space and distance. A clear articulation of these constructs and their relationship to each other is a critical departure point for this thesis. The chapter also introduces the methods and techniques that are employed to measure distance and accessibility.

GIS is discussed as an emerging technology which provides a set of computer-based tools for spatial analysis capable of measuring accessibility of health facilities and services to assist in decision-making about health care planning and service provision (Perry & Gesler, 2000; Love & Lindquist, 1995). GIS applies quantitative methods to calculate physical distance. As this study attempts to focus on the application of quantitative measures of accessibility to health care service delivery, GIS will be useful in this regard. Concluding this chapter is a review of literature that explores the relationship between accessibility and health service utilization and health status. The relationship is examined in the context of developing countries and South Africa.

## 2.2 Concepts of space, distance and accessibility

Space is a relation defined on a set of objects (Gatrell, 1991). The concepts of space can be divided into physical space and relational space. Physical space is the relation defined on a set of objects that is largely defined by physical factors influencing the relationship between the objects. Physical space can be measured using quantitative metrics. Physical space is further divided into absolute space and relative space. Absolute space can be conceptualised by a straight line drawn between pairs of objects. Absolute space is continuous and cannot be changed by any matter or energy (Abler *et al.*, 1971).

The metric for measuring absolute space is absolute distance. Absolute distance is also referred to as Euclidean distance (Gatrell, 1991). The metric units for measuring absolute distance are miles or kilometres. Absolute distance has been a major consideration in health care planning and health facility placement in developing countries and sub-Saharan Africa. This is based on the assumption that most people in these countries access health facilities on foot. Another assumption is that people use their nearest health facility (Joseph & Phillips, 1984; Phillips, 1990).

Relative space represents physical realities and can be defined as a relation on a set of objects relative to human activity. Therefore, relative space changes, (shrinks or stretches) depending on intervening obstacles such as traffic, mountains or social interactions (Abler *et al.*, 1971). Measurements of relative distance have been necessary to measure distance relative to human activities since Euclidean distance does not take into account barriers or intervening obstacles. Examples of physical factors that might influence accessibility of clinics would be topographical barriers like mountains or valleys between the objects or the presence and quality of transport services between the objects.

Manhattan space or 'taxi-cab' distance and Riemann space are two forms of relative space. In Manhattan space, the shortest distance between two points is a path consisting of line segments, which meet at right angles. This space shows that in the city of New York (as in other cities) actual distance travelled is not the shortest distance between two points, but it is dependent on the roads, which travel around blocks of buildings. Distance within Manhattan space can be measured in terms of overcoming difficulty of going around the blocks, that is, the time or cost spent to achieve this task. The time will be longer (stretched) or shorter (shrunk) depending on the density of the traffic (Abler *et al.*, 1971).

Riemannian space is measured in the same way as Manhattan space, except that the shortest distance between two points is a curved line, for example, a route around a mountain. While the concept of Manhattan space applies mainly to urban areas and to people utilising transportation, the concept of Riemannian space would be more applicable to rural areas where there are rivers or mountains to overcome before reaching destinations. However, people who travel on foot particularly in rural areas, use the shortest and quickest possible routes between homesteads and clinic i.e. footpaths, which follow contours, negotiate topography and avoid obstacles.

For the purpose of this thesis, this form of relative space will be called footpath space. Footpath space is useful for understanding the movement through rural areas where people do not always travel in straight lines. For example, instead of going out of the kraal of the homestead through the main entrance, rural people would choose to go through an opening in the kraal or pass through their neighbour's yard. Footpath distance is thus an appropriate metric for measuring accessibility of clinics in rural areas. The metric for measuring relative space is relative distance and can be measured in monetary or time units such as Rands and minutes. Time and cost are said to be far more powerful determinants of accessibility than are absolute distances and they are thus better explanatory variables of spatial



behaviour (Phillips, 1990). However, measurement of time is very complex, laborious and expensive (Perry & Gesler, 2000). In South Africa, MCH services are offered free of charge at the clinics in rural areas. For these reasons, measurement of time and cost will not form part of the analysis in this study.

Relational Space is a relation defined on a set of objects that is defined by macro- and micro-environmental forces which may be political, social, economic, cultural or environmental in nature, and which are measured using qualitative methods. An example of how these forces might influence accessibility of clinics in relational space would be the effect of political conflict between the African National Congress and the Inkatha Freedom Party in certain parts of the province on clinic services and the ability of clients to use those services.

This political allegiance and the location of a clinic in an area of a particular political dominance would be the relation that binds the homesteads and clinics together. Examples of micro-environmental forces operating in relational space would be the socio-economic status of clients (ability to pay) or the competency of clinic nurses. Relational space will not be discussed further in this thesis since it is not the intention of this study to examine health service utilization and health status in a relational space. However these complex forces in relational space may be very important determinants of accessibility in many rural areas.

Since this study attempts to understand the relationship between accessibility and health care, the researcher has decided to employ absolute distance that separates health service providers and consumers, as a surrogate measure of accessibility. For the purpose of this study, accessibility refers to the ability of an individual to obtain health services within reasonable reach and would include both absolute and relative distance (UNSD, 1997).



In this thesis absolute distance is used to refer to physical distance that separates homesteads and PHC facilities. The phrase 'other factors of accessibility' such as age, sex, educational level, parity, transport, cost and time is used to refer to relative space. The term physical accessibility is used interchangeably with absolute distance. Section 2.3 provides a brief introduction of the methods and techniques that are used to measure spatial relationships in the context of health care.

## **2.3 Measurement of distance**

This section explores the methods and techniques applied when measuring absolute and relative distances. Different metrics i.e. systems of measurement are explained. The application of GIS technology is also presented. This discussion provides the necessary conceptual framework before the relationship between accessibility and health service utilization and health status is examined.

### **2.3.1 Measurement of distance within absolute space**

Before the distance between points in absolute space can be measured, the location of these points needs to be fixed. Geographical co-ordinates of longitude and latitude provide point locations in absolute space. In absolute space the shortest distance between two points is a straight line or Euclidian distance. There are two different but complementary techniques that can be applied to measure Euclidian distance to define a spatial relationship between two points, in this case, homesteads and clinics. These techniques are *Thiessen polygons* and distance buffers (see chapter 3 for more details). The application of absolute distance between two points is based on distance minimization model or proximity model where the shortest absolute distance between health facilities and catchment populations is determined.

Thiessen polygons are also referred to as location-allocation models and have been applied to measure physical accessibility of people's homes to health facilities. (Bennet, 1981; Oppong & Hodgson, 1994). A Thiessen polygon is a polygon bounding the region closer to a point than to any adjacent point. Polygons are drawn so that the lines are of equal distance between two adjacent points of interest, in this case the selected residential clinics (Bailey & Gatrell, 1995; Burrough, 1986).

Distance buffers are also referred to as the coverage technique (Oppong & Hodgson, 1994). This technique is used to determine the proportion of population covered by clinic services within specified distances from the clinic. Geodata Institute (1990) defines buffers as boundaries created around points, lines or areas at an equal distance in all directions resulting in a circular, corridor or polygon shaped features or catchments. These features represent areas at set distances from the original object. The health facility or point source is located at the centre of the catchment.

The advantage of using the two techniques to calculate absolute distance is that they are easy and quick to apply. The disadvantage of these techniques is that they all measure Euclidian distance. This measurement assumes that people travel in straight lines. This ignores intervening obstacles. Techniques that take the existence of intervening obstacles into consideration are described below and these techniques measure distances in relative metrics.

### **2.3.2 Measurement of distance within relative space**

Relative distance is the distance between points within relative space and is a distance related to human activity. It is a measure of human effort to overcome the 'friction of distance'. For the purpose of this study, relative distance is defined in terms of factors such as travel time in seconds, minutes and hours taken to reach a health facility, the

amount of money (Rands, cents, dollars etc.) spent to pay for services, transport, demographic characteristics or quality of services. Intervening obstacles such as employment, income, demographic characteristics and quality of health services affect the measure of relative distance. Research has shown that a better socio-economic status is linked to frequent use of health services and improved health status. People, who are employed, may have financial means, be educated, own a car or afford transportation costs, belong to a medical aid scheme and maybe afford the cost of health care and therefore use the services more often and travel further for better quality services (Abbas & Walker, 1986; Airey, 1992; Gilson *et al.*, 1995; Habib & Vaughan, 1986; Hays *et al.*, 1990; Kaliszer & Kidd, 1981; Kloos, 1990; Malcolm, 1996; McCaw-Binns *et al.*, 1995; Phillips, 1990; Rosenberg & Hanlon, 1996; Toan *et al.*, 1996; Wong *et al.*, 1987; Wyss *et al.*, 1996).

Demographic characteristics include factors such as age, sex, educational level, family size, marital status, extent of polygyny and parity. For example, it is widely known that children and reproductive women are the main consumers of health services (Defo, 1997; Hays *et al.* 1990; McCaw-Binns *et al.*, 1995; Phillips, 1990; Rosenberg & Hanlon, 1996; Toan *et al.*, 1996; Wong *et al.*, 1987). More about how these factors affect service utilization and health status is presented later in section 2.4.

The quality of services as an indicator of relative distance is measured by the facility infrastructure such as water system, modes of communication, electricity, availability of emergency vehicles, the adequacy and the attitude of staff, availability of medical equipment and drugs. Quality of care affects one's decision to seek care. The better the perceived quality of care, the more use of health services and therefore, the better is the health status (Annis, 1981; Auerbach, 1982; Doherty *et al.*, 1996; Fonn *et al.*,

1998; Finerman, 1983; Iyun, 1983; Gilson *et al.*, 1995; Lucas & Rosenthal, 1992; Thaddeus & Maine, 1994; Thipanyana & Mavundla, 1998). The advantage of using absolute distances as a measure of accessibility instead of these factors is that the calculation of absolute distance is simple. The data are easy to collect and the tools for analysis are readily available. On the other hand, data required to measure relative distance is difficult to collect and the analysis is laborious. Given these limitations, it was decided that this study will employ measurements of absolute distance as an indicator of accessibility.

### **2.3.3 Measurement of distance and accessibility using GIS**

Measurements of both absolute and relative distances have been criticised for often being laborious and time-consuming, particularly where long and complex statistical and mathematical formulae have to be manually applied. With the advent of GIS technology, the manipulation of distance measurements has become easier and quicker. A GIS applies absolute physical space as its spatial framework (Gatrell, 1991). Calculation of physical accessibility is now possible within GIS using the same techniques described above (Bullen *et al.*, 1996; Dowie *et al.*, 1991; Gatrell & Dunn, 1995; Hall & Bowerman, 1996; Kohli *et al.*, 1995; Krige, 1990; Love & Lindquist, 1995; Parker & Campbell, 1998; Perry & Gesler, 2000; Walsh *et al.*, 1997; Zwarenstein *et al.*, 1991).

A GIS can be defined as an information management technology, made up of a set of software tools designed for collecting, storing, retrieving, transforming, displaying and disseminating spatial as well as attribute data (Burrough, 1986). A GIS comprises a relational database management system, which is fully integrated with a cartographic or computer mapping system (Twigg, 1990). GIS is a potentially useful planning and management tool in many work sectors, e.g. forestry, climatology and meteorology,

health, agriculture and water management (Prather & Callinan, 1993). Spatial data within GIS are represented by a point, line or polygon. A point is an object that occurs at one physical location in physical space and which has only one reference coordinate for example, a health facility or a house. A line is an object, which spans between points and thus requires at least two reference coordinates, its start and its end, to define its spatial location, for example, roads or rivers. A polygon is a collection of line segments that close to form discrete units (Burrough, 1986; Gatrell, 1991). The spatial query operations and related GIS capabilities such as buffering and object overlay are ideally suited for measuring accessibility to health services both for current population and projected population in a long-term planning context.

GIS techniques greatly enhance the accuracy and flexibility of distance measures as it predominantly based on absolute measures of distance. GIS has the ability to present visual displays of accessibility results and the capability to manipulate data using many different scenarios rapidly. Many authors have written about the benefits and applications of GIS in health (Albert *et al.*, 1995; Briggs & Elliott, 1995; Bullen *et al.*, 1996; Curtis & Taket, 1989; Hall & Bowerman, 1996; Love & Lindquist, 1995; Twigg, 1990).

At the time of this study, GIS in South Africa was an emerging tool, which has only recently been applied to analyse health issues. One study examined the application of GIS in planning and to support decision making for malaria control in KwaZulu-Natal province (Stuttaford, 1994). The other study explored the use of GIS in health service provision (Zwarenstein *et al.*, 1991). The latter study determined the distribution of hospital beds in KwaZulu-Natal. Although the GIS software used in both studies (Arc Info 3 and dos-based IDRISI) was complex and user-unfriendly, this study used MapInfo® GIS, which is easy to use.

Given the advantages of GIS technology and a range of GIS applications available for demonstrating the spatial relationship between accessibility and health care, GIS was chosen as an appropriate tool to measure physical accessibility of specific health services and health status provided in section 2.4.

## **2.4 Accessibility of health services and health status**

The intention of this section is to review case studies that have demonstrated the relationship between accessibility and health service utilization and health status. It is an underlying premise of this thesis that health service utilization and health status can be improved when the physical barriers to accessibility have been overcome. As mentioned earlier, accessibility refers to the ability of an individual to obtain health services within reasonable reach, even though utilization cannot be guaranteed because of intervening factors that may prevent movement through physical space (Joseph & Phillips, 1984).

Health service utilization refers to evidence that accessibility has been achieved and distance overcome. Similarly accessibility cannot be guaranteed because of intervening social, economic and cultural factors. Nevertheless, the wide use and continued utility of simple absolute distance measures as a proxy for accessibility of health services argues strongly for a study to determine the effect of absolute distance from clinics on health service utilization in rural South African populations. Complex interactions between individuals and their environment, influenced by social, demographic, cultural, and biological considerations, may have a greater impact on certain health status indicators, such as nutritional status than health service interventions alone. The classical observation that the major reduction in TB-associated mortality in Great Britain occurred long before the introduction of anti-TB therapy, is a commonly cited case in point (Everybody's business, 1976).

Evidence presented in Chapter 1 and from elsewhere confirms that people in rural areas of South Africa and developing countries are always at a disadvantage with regard to health service provision. For this reason, the following sections focus on studies that explored the relationship between accessibility of health services in particular absolute distance, and health status outcomes in developing countries and South Africa.

#### **2.4.1 Accessibility of health services and health status in developing countries**

Absolute distance from health facilities has been considered an important factor influencing health service utilization and, in turn, health status of rural communities in developing countries (Jolly & King, 1966; Muller *et al.*, 1998; Phillips, 1990; Schellenberg *et al.*, 1998; Stock, 1983; Thaddeus & Maine, 1994). Therefore, absolute distance has also been used as a basis for health service planning and health facility placement in developing countries including South Africa. This is based on the hypothesis that health service utilization and health status declines with increasing absolute distance from health facilities. This section explores evidence to support this hypothesis.

Rahaman *et al.* (1982) studied the effect of accessibility on attendance at diarrhoea clinic and mortality in rural Bangladesh during 1977-78. The authors found that more than 90% of the patients who lived within one mile of the clinic attended the service, and that the attendance rate dropped as absolute distance from the clinic increased. More patients who lived at absolute distances between two and five miles away from the clinic required high care treatment for diarrhoea such as administration of intravenous fluid and than those who lived less than one mile from the clinic. Similarly, mortality due to diarrhoea was high in those people living further away from the clinic. Within absolute distances of one mile, mortality rates were 100-150 deaths/100 000 people, but this increased to 260 deaths /100 000 people within 3-5 miles.

In Calabar, Nigeria, Freeman *et al.* (1983) determined the relationship between accessibility and registration and clinic attendance by mothers with children 0-5 years of age. Their results showed that women who lived closer to the GPs made more frequent clinic visits for child health care, while mothers from far away were discouraged by longer absolute distances.

In a household survey undertaken by Habib & Vaughan (1986) in southern Iraq, on 337 households, the determinants of health service utilization, consultation and utilization rates for infections and parasitic diseases, hypertension and heart diseases were determined. It was found that these rates declined with increasing absolute distance from the health centre.

Abbas & Walker (1986) supported the findings from the above studies. These researchers determined utilization patterns of MCH services by married women in both rural and urban areas of Jordan. The findings reveal that ANC attendance was lower in rural communities. Only 38% of the rural women used delivery services, while 60% of their urban counterparts used MCH services mainly at private facilities. The lower rates among the rural women were due to the fact that 72% of them lived further than 5 km from the MCH centre compared to only 7% in cities and 10% in other urban areas. Furthermore, low parity of one to three births and above seven births, time and cost of travelling, low educational status and shorter duration of marriage were associated with non-use of ANC and delivery services. These findings provide further insight into the accessibility issues faced by rural women and supported the notion that absolute distance in combination with intervening factors of accessibility determines accessibility of health services.



In Tangail district, rural Bangladesh, Paul (1991) conducted a three-stage sample study in 1984 to measure the effect of absolute distance on post-neonatal mortality rates (PNNMR) in 1 800 women who had given birth at the hospital. The study found that large distances were directly related to high levels of PNNMR. At absolute distances of less than two miles from the health centre PNNMR was found to be 27 deaths/1 000 live births, while this increased to 39, 40 and 51 deaths/1 000 live births in respective distances of between 2-4, 4-6 and >6 miles away from the health centre. Similar results were obtained for distances to a qualified doctor. These findings still confirm the negative effects of absolute distance on health outcomes in this rural setting.

In their review of literature on factors that affect maternal mortality in the developing countries, Thaddeus & Maine (1994) support their argument by quoting an example from Mexico, where rural farmers had to travel 30 km to reach the nearest health facility. This distance is six times higher than the 5 km limit set by the WHO recommendation for accessing rural facilities in developing countries (WHO, 1981). The authors also identified other factors of accessibility such as transport, cost of services, quality of care as determinant of health service utilization and health status.

Figa'-Talamanca (1996) provided examples from rural areas and asserted that large absolute distances between home and hospital were responsible for the majority of maternal deaths. The author suggested that use of maternity waiting homes (MWHs) in rural areas of developing countries was beneficial to reduce these maternal deaths. The author cited examples from Malawi, which showed that before the women were provided with MWH they had to travel an absolute distance of 250 km to reach the hospital. An example from Ethiopia indicated that a hospital was 17 km from the nearest town. Other hospitals were 100 km and 180 km from the rural population of Attat. The author said that it took the women one to two days walk to reach the road to the nearest hospital.

In the Ethiopian example, women outside the MWHs were reported to have had stillbirths of 10 times higher than that of women staying in the MWHs and the hospital maternal mortality rate was recorded as 2 700 deaths/100 000 people. In Wosera sub-district, Papua New Guinea, Muller *et al.* (1998) studied the effect of absolute distance on 4348 health centre attendances for malaria and acute respiratory infections. This study showed that attendance decreased with increasing absolute distance from the health centre. The study demonstrated that health centre attendance decreased by more than a third at absolute distances above 5 km.

Schellenberg *et al.* (1998) examined the spatial patterns of severe malaria in children under the age of five years in Kilifi district, rural Kenya. Hospital cases from 1991 to 1993 were reviewed and the effects of both absolute and road distances from the hospital on admission rates were determined. Admission rates for malaria were higher in children who lived within 5 km of a hospital than in children who lived more than 25 km of a hospital. Similarly, more children who lived 0.5 km from a road attended the hospital than those who lived 2.5 km from a road. The study also showed that hospital service utilization decreased with increasing absolute distance from the hospital for admission of any cause of illness.

The studies reviewed in this section demonstrate that accessibility as measured by absolute distance from a health facility is a major independent determinant of health service utilization and health status in developing countries. Some of these studies also demonstrated the effects of other factors of accessibility on health service utilization and health status suggesting that these factors and absolute distance are interrelated. The discussion of the effects of accessibility on health service utilization and health status is explored further in section 2.4.2 with reference to the South African context.

#### **2.4.2 Accessibility of health services and health status in South Africa**

Literature on absolute distance and its relationship with health service utilization and health status in South Africa is limited. A number of studies in South Africa provide descriptions of attendance rates as indicators of MCH service utilization, and morbidity and mortality rates as indicators of MCH status, without actually linking the rates to accessibility or absolute distance (Buchmann *et al.*, 1989, 1992; Couper & Walker, 1997; Rip & Hunter, 1990a; 1990b; SADHS, 1998; SAVACG, 1995; Solarsh *et al.*, 1994). For example, Jinabhai *et al.* (1994) interviewed African women in KwaZulu-Natal province, regarding maternal health service utilization in different areas. The researchers found that maternal health service utilization was lower for women who lived in rural and peri-urban areas than for women who lived in urban areas.

The researchers deduced that travel time, educational level, socio-economic factors and absolute distance could be responsible for low maternal health service utilization, particularly in rural women. Wilkinson *et al.* (1997a) measured the indicators of MCH service utilization in Hlabisa district, rural KwaZulu-Natal province. Although absolute distance or accessibility was not measured, the authors used service utilization rates as an indication that accessibility has been achieved. Other studies have measured the effects of factors of accessibility other than absolute distance on MCH service utilization rates (Fonn *et al.*, 1998; van Vuuren & de Klerk, 1995; Mametja *et al.*, 1993).

Two studies have focussed exclusively on physical accessibility of health services. One of these studies was conducted in Elliodale district, rural Eastern Cape province (Thipanyana & Mavundla, 1998). The researchers in this study interviewed people about how far they lived from health facilities and estimated absolute distance. Although the authors did not directly measure the effect of distance on health service utilization, their

results reveal that 82.5% of the community lived within 6-20 km from the clinics and that 46.5% of the community utilised the clinic services. This demonstrated that many people still lived at great distances from health facilities suggesting that low utilization of clinics could be attributed to absolute distance amongst other determinants of health service utilization. In the second study van Vuuren & de Klerk (1996) studied accessibility of health services in Bloemfontein by interviewing 450 respondents. Although the exact distances were not calculated, the respondents were asked whether they lived near or far from the health facility. Their results show that 47% of the African respondents lived far away from the clinic compared to 75% of the white and 69% of the coloured respondents.

Three studies have studied the effects of absolute distance on health service utilization. The first of these studies was conducted in Mosvold sub-district, Umkhanyakude District, KwaZulu-Natal province (Buchmann *et al.*, 1987). Absolute distance to the nearest clinic was measured on foot and then linked to vaccination coverage of children aged 12-23 months. The findings show that the percentage of fully vaccinated children decreased from 82% in 0-5 km to 62% in 6-10 km and to 47% beyond 10 km from the clinic.

The second study was conducted in Bizana district, rural Eastern Cape province by O'Mahony & Steinberg (1995). This study showed that the percentage of home deliveries increased with increasing absolute distance from the hospital. For example the percentage of home deliveries was 37.5% at below 10 km but this increased to 64.3%, 65% and 70% at distances of 10-19 km, 20-29 km and 30-39 km from the hospital respectively.

Tanser *et al.* (2001) examined the effect of distance on health service utilization in Hlabisa district, KwaZulu-Natal province. These authors measured accessibility of health care by defining catchment areas for PHC clinics and used interviews to collect data on clinic utilization from 24 236 homestead members. It was found that the majority of people were utilizing their nearest clinic and that clinic utilization decreased with increasing distance from the clinic.

The first two studies that demonstrated the effect of distance on MCH service utilization provide information on only two indicators of MCH service utilization. The study by Tanser *et al.* (2001) examined the effect of distance on general clinic utilization, but not MCH service utilization. No other studies were found that examined the effect of absolute distance on other indicators of MCH service utilization and MCH status such as ANC attendance, family planning, clinic delivery, LBW and nutritional status in South Africa.

## **2.5 Summary**

Chapter 2 provides definitions of the concepts of space, distance and accessibility. Space is defined as a relation defined on a set of objects. The concepts of physical space and relational space were defined. Absolute space and relative space are also defined as two forms of physical space. Absolute space is measured by absolute distance in metric units such as kilometres, miles, centimetres etc., while relative distance is measured in metric units such as hours, minutes, Rands, cents etc. Methods and techniques that are used to measure distance within absolute space and relative space are provided. GIS is discussed as a new technology with the capacity to define and describe spatial relationships within absolute space.

The cited literature demonstrates the relationship between accessibility and health service utilization and health status in developing countries, and, specifically, in South Africa. Studies conducted in developing countries provide strong evidence to support the hypothesis that health service utilization and health status decrease with increasing absolute distance from health facilities. This emphasizes the importance of using absolute distance as a basis for health planning and health facility placement in developing countries including Sub-Saharan Africa.

In South Africa, there is a paucity of literature on absolute distance and its effect on health service utilization and health status. Two of the three studies conducted in South Africa, demonstrated distance effects on two indicators of MCH service utilization. The third study examined distance effect on general clinic utilization, but not on specific indicators of MCH service utilization. Since distance effect for other indicators of MCH service utilization and MCH status is not known, the findings from these three studies provide little evidence to support the above hypothesis. This clearly emphasizes the need for the study that will explore distance effect for MCH service utilization and MCH status and contribute towards a better understanding of distance as a basis for health planning and facility placement in South Africa. In this study the relationship between absolute distance of homesteads from PHC clinics and MCH service utilization and MCH status was examined by applying the methods and techniques described in chapters 3 and 4.

## **CHAPTER 3**

### **MEASUREMENT OF ACCESSIBILITY**

#### **3.1 Overview of study methods**

In studying the relationship between accessibility and MCH service utilization and MCH status, the researcher has followed three broad methodological steps. Briefly these steps are: (a) the delineation and comparison of clinic catchment areas based on absolute distance and usage; (b) the determination and comparison of minimum, maximum and mean absolute distances travelled by homestead members to PHC clinics in the periods before and after the CUBP; and (c) the comparison of MCH service utilization and MCH status patterns at different absolute distances from PHC clinics. Each of these broad methodological steps can be characterized into various analytical methods and GIS techniques.

The delineation and comparison of clinic catchment areas based on absolute distance and usage required the preparation of an analytical database from the Malaria Information System, the delineation of catchment areas for PHC clinics based on absolute distance using Thiessen polygons, the delineation of catchment areas for PHC clinics based on usage and the comparison of catchment areas for PHC clinics based on absolute distance and usage. All GIS analysis was performed in MapInfo® GIS software. The level of analysis for delineation and comparison of clinic catchment areas based on absolute distance and usage involved the entire Umkhanyakude District comprising the Ingwavuma and Ubombo magisterial districts and all PHC fixed clinics. The purpose of this broad methodological step is to determine whether distance provides a reasonable

proxy for health service utilization. This is the first and most macro level at which the relationship between distance and service utilization is addressed in this study. The calculation of absolute distances for each of the periods before and after the CUBP to determine minimum, maximum and mean distances travelled by homestead members to PHC clinics during these periods involves three sets of analytical methods and techniques.

These are the calculation of absolute distances between homesteads and PHC clinics for each time period using GIS and the comparison of absolute distances for the two time periods using statistical methods. The level of analysis in this step involves the entire population and the PHC clinics that existed before and after the CUBP in the study area. This calculation provides an important description of the distribution of individual homesteads in relation to the clinics that their members claim to use. It also informs the definition and creation of distance buffers described in the MCH survey, sample size calculations and the sampling strategy.

The comparison of MCH service utilization and MCH status patterns at different distances from PHC clinics includes the sampling of clinics, generation of distance buffers around clinics and random sampling of homesteads within each distance buffer for the MCH survey, collection of the MCH survey data and analysis of the association between accessibility and MCH service utilization and MCH status. The level of analysis for this broad methodological step is a subset of the population selected from the study area. This sample is considered sufficient to be able to answer the research question. The comparison of MCH service utilization and MCH status patterns at different absolute distances from PHC clinics aims to determine the effect of accessibility on MCH service utilization and MCH status.



To achieve all these steps, the researcher required a research design that has broadly two discrete sets of methodologies, which are described in chapters 3 and 4. Chapter 3 focuses on measurement of accessibility by applying the first two broad methodological steps i.e. the delineation and comparison of clinic catchment areas based on absolute distance and usage and the determination and comparison of minimum, maximum and mean distances travelled by homestead members to PHC clinics before and after the CUBP. These steps describe analytical methods and GIS techniques applied to measure the level of accessibility based on absolute distances of homesteads from PHC clinics. The chapter begins with a description of the study area to provide a context for the methodologies described in both chapters 3 and 4.

Chapter 4 presents the methodology for comparison of MCH service utilization and MCH status patterns at different distances from PHC clinics. The chapter provides a detailed account of the extensive MCH survey of service utilization and health status patterns of children 12-23 months and their mothers. The chapter further describes the methods used to determine accessibility measured from absolute distance buffers and the analysis of the effect of accessibility on MCH indicators of service utilization and MCH status.

### **3.2 Study area**

The study area is described in terms of geography and topography, political and social structures, health facilities and infrastructure, social and demographic profiles, economic status and health profiles of the population.

### 3.2.1 Geography and topography of the study area

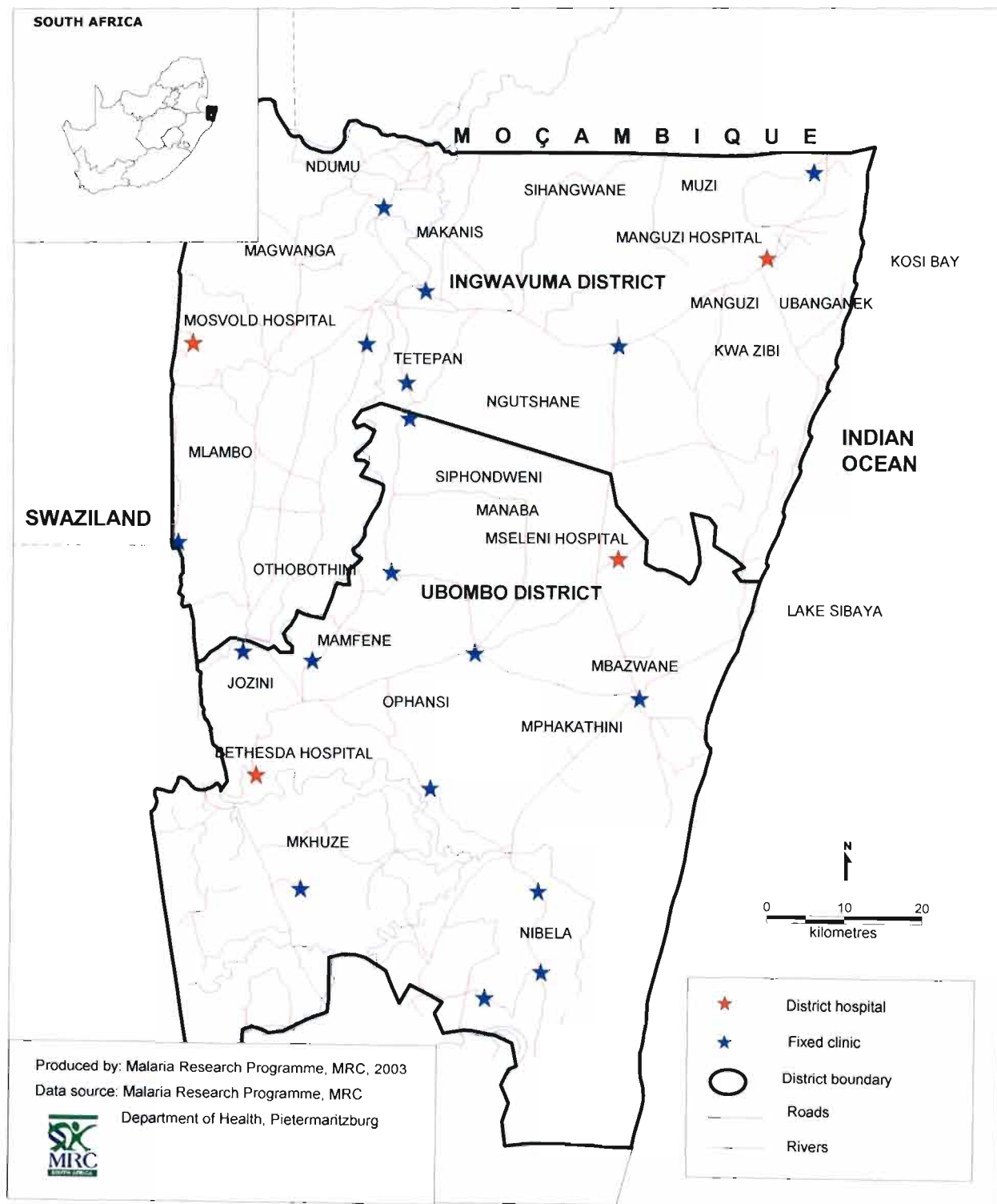
The study area is Umkhanyakude District, which is located in the remote rural north-eastern corner of KwaZulu-Natal province, South Africa (Fig. 3.1). The study area comprises the two magisterial districts of Ingwavuma and Ubombo. Umkhanyakude District is a sub-tropical area formerly known as "Maputaland" and covers an area of 9 240 km<sup>2</sup>. The region is bordered by Mozambique in the north, Swaziland and Lebombo Mountains in the west, Lake St. Lucia in the south and Indian Ocean in the east. Apart from the Lebombo Mountain range, the area is very flat with altitudes below 100 m and has few natural features that may interfere with the movement of people on foot.

### 3.2.2 Political and social structures

Umkhanyakude District is a rural area formerly under the KwaZulu Government, but now incorporated into the KwaZulu-Natal province. Tribal authorities govern the community. The main authority figure is the *Inkosi* (chief), followed by the *Induna*. Parallel civic structures were put in place after the 1995 democratic local elections, represented by elected councillors as agents of government at the local level. The population of Umkhanyakude District is comprised mainly of Zulu- and Tonga-speaking people.

Most of these people live in inaccessible areas of scattered homesteads and not in villages. One homestead usually consists of multiple free-standing structures and contains an extended household made up of a number of family members. However, the social organisation of these continues to be based on a patriarchal system (Derman & Poultney, 1989). This arrangement means that in spite of formal civic structures any proposed activities or development that are to take place in the area have to be reported through the tribal authorities and the traditionally male head of homestead.

**Figure 3.1 Study area: Umkhanyakude District, KwaZulu-Natal province**



### **3.2.3 Health facilities and infrastructure**

Umkhanyakude District is now part of the newly demarcated Jozini/Empangeni Health Region. This health region extends from the Mozambique border to the north of Tugela River in the south. Umkhanyakude District consists of four health sub-districts demarcated by the four district hospitals of Mosvold, Manguzi, Bethesda and Mseleni (see Figure 3.1). The District Office based in the small rural town of Jozini, is an overarching administrative structure for the entire DHS. The District Office comprises a complex of health offices and is the location of the Malaria Control Programme, the Environmental Health Section and the Nutrition Team (Department of Health KwaZulu-Natal, 2000). Umkhanyakude District is a semi-autonomous DHS and therefore manages its own health affairs. The health system provides a range of PHC services for the population. Free health care is available to mothers and children under the age of six years.

At the time of this study in 1998 comprehensive PHC services were provided by the four district hospitals, 19 fixed clinics and 69 mobile visiting points (Department of Health KwaZulu-Natal, 2000). The hospitals are staffed by generalist medical officers and by senior and junior nursing staff. The fixed clinics are supplied with medicines and drugs by, and obtain clinical support from, their referral hospital. The fixed clinics offer preventive, promotive and curative care for minor ailments and rehabilitative care. At least one senior nursing sister and two or more enrolled staff nurses render their services at the fixed clinics. At the time of the study, all fixed clinics were serving a population of more than 10 000, which is the ideal, recommended population coverage of clinics (WHO, 1981). The mobile services have been set up to provide health care to pockets of the catchment population that are underserved by the residential facilities.

These mobile services can be quite flexibly redistributed in response to changing population health needs or the establishment of new clinics. The mobile points are available once or twice a month and offer preventive services only. Community health workers (CHWs) are a special cadre of lay health workers. CHWs play a major role in health education at homestead level. CHWs are locally selected by a community and trained by the Community Health Facilitator (CHF) in their own community (Knight, 1998).

Each CHW visits an allocated set of homesteads to convey health messages and at the same time collects community data such as births and deaths. Not all areas were served by CHWs. Some homesteads were visited by CHWs from neighbouring areas. At the time of the study there were 427 CHWs and 191 volunteers serving Umkhanyakude District (Department of Health KwaZulu-Natal, 2000). The average number of homesteads per CHW is about 120 and this amounts to more than 600 people visited by each CHW per month.

An earlier assessment of accessibility of facilities and services in Umkhanyakude District by Vanderre Apsey Robinson & Associates (1989) has shown that a lack of regular and affordable transportation compelled more than 60% of homestead members to travel more than two hours a single trip to reach clinics. All these conditions suggest that accessibility of PHC services offered in Umkhanyakude District was not adequate to meet the needs of the community. This led the researcher to suspect that travel distances between residences and the functional clinics were greater than the recommended 5 km and that these distances would affect health service utilization and health status, particularly of mothers and young children as these are the most vulnerable and main consumers of health services.

#### **3.2.4. Social and demographic profiles**

The total population of Umkhanyakude District was estimated at 258 022 in 1991 and has increased to 304 222 in 1996. Ninety-eight percent of this population is rural. Fifty-six percent of the population consisted of women. Thirty-seven percent of these women were in the reproductive age group. Approximately 20% of the population comprised children less than 5 years of age (Statistics South Africa, 1996). Since women of reproductive age and young children comprised the larger part of the population, this segment of the population was expected to be the main consumers of health services. Therefore, the effects if any, of low accessibility were expected to be greatest in this segment of the population.

Umkhanyakude District has a high level of functional illiteracy of more than 60%. There is also a large number of school age children who were not attending school. The reasons given for non-attendance of school included unaffordability of school fees; children were helping parents with domestic chores and long distances from homesteads to schools (The Education Foundation, 2000).

#### **3.2.5 Economic status**

The people in Umkhanyakude District are rated amongst the poorest communities in South Africa with an average monthly household income of less than R800. There is a high unemployment rate and more than 87% of the population has no regular source of income. Most men aged between 20 and 55 years leave their families to seek employment in larger towns. At the time of this study, 85% of females were unemployed. The community relied on remittances from absent household husbands who were migrants and the monthly government pension and state grants. The value of the government pension grant was just above R 500 per month at the time of this study

and it is now approximately R700. There was a small percentage of the population that was engaged in commercial farming and subsistence agriculture. Rice, cotton and sugar cane were grown in the Makhathini Irrigation Scheme as commercial crops, while most people grew maize, and vegetables for household consumption. Many households keep livestock such as cattle, goats and chickens. The timber plantations at Mbazwana near Sodwana Bay provides local people with employment. Although under-developed, Umkhanyakude District has an enormous potential as a tourist attraction. There are a number of game reserves and nature parks. Despite this potential, the employed segment comprised only 29.6% of the population (Statistics South Africa, 2000).

### **3.2.6 Health profiles of the population**

As is the case in many under-developed rural districts of South Africa, the majority of the population in Umkhanyakude District lack basic needs such as clean water, adequate housing, sanitation and electricity (Statistics South Africa, 2000). As a result of these conditions and overcrowding, Umkhanyakude District is rife with diseases such as malaria, HIV/AIDS, TB, schistosomiasis, intestinal parasites and anaemia (Abdool Karim *et al.*, 1992; Appleton *et al.*, 1999; Department of Health KwaZulu-Natal, 2000; Knight, 1998; Schutte *et al.*, 1981a; 1981b).

Furthermore, previous studies conducted in the study area have shown that the MCH service utilization and MCH status in Umkhanyakude District was worse off than in other districts of KwaZulu-Natal province. For example, possession of a RTHC, vaccination coverage and ANC attendance were low and the number of home deliveries was high (Buchmann *et al.*, 1987; Buchmann *et al.*, 1989; 1992; Jepson & MacDonald, 1988). This is completely at variance with observations in other parts of the province where possession of a RTHC and vaccination coverage was high and supervised deliveries ran consistently at 80% (Dammann *et al.*, 1990; Kettles & Kibel, 1991; Jinabhai *et al.*,



1994). In addition, vaccine-preventable diseases such as Hepatitis B and measles and perinatal and infant mortality rates were highly prevalent in the study area (Abdool Karim *et al.*, 1988; Abdool Karim *et al.*, 1989; Abdool Karim & Tait, 1993; Briggs-Crofton *et al.*, 1992; Buchmann *et al.*, 1989; Couper & Walker, 1997).

From the background provided in this section, it is evident that the study area is an under-developed rural setting in which the communities were deprived of many basic needs as evidenced by high levels of poverty, illiteracy, unemployment, poor health status and inadequate access to health services. More use of health services is anticipated in the future as access has been improved by the initiation of the restructuring of the NHS since 1994. This included introduction of the CUBP and removal of user fees for pregnant women and children under age six years. However, more information is needed that relates the increase in the number of PHC clinics to the uptake of health care, before firm conclusions can be drawn regarding the effectiveness of the NHS.

### **3.3 Data sources**

This study makes use of two main sources of information namely, the Malaria Information System (MIS) database and the MCH survey. The details about the MIS are provided in this section and the data collection for the MCH survey is described in chapter 4. The MIS provided data for measurement and analysis of accessibility of health care services. The MCH survey provided data on MCH service utilization and MCH status of mothers and children aged 12-23 months. The MIS is a database established for planning and decision-making regarding malaria control activities and research. This database was established as a joint effort between the Malaria Control Programme, Department of Health, Umkhanyakude District, and the Malaria Research Programme,



MRC, Durban. The MIS contains data about malaria incidence of all homesteads in the northern eastern KwaZulu-Natal malarious districts. Since the Umkhanyakude District carries the highest prevalence of malaria in KwaZulu-Natal province, more than 34 000 homesteads have been mapped in this area to facilitate malaria surveillance and control activities. The MIS database consists of eight data fields in the core dataset. Data on malaria incidence, type of wall for each homestead for purposes of insecticide house-spraying, school and health facilities data are located in different databases linked to the core MIS database through a unique permanent identity number or PIN (see Appendix 1). The fields in the core MIS dataset include the PIN, the area in which the homestead is located, the section, the homestead number, the name of the health facility in which the homestead members obtain health services, the location of the homesteads (latitude and the longitude) and the number of people in each homestead.

A detailed description of the MIS database has been previously provided (Le Sueur *et al.*, 1997; Martin *et al.*, 2002). Surveillance agents from the Malaria Control Programme collect data for the MIS database by routinely visiting the homesteads to actively screen for malaria patients. In addition to providing information regarding malaria control activities, these surveillance agents have systematically collected clinic utilization data from these homesteads in 1994 and updated in 1996. This was done by asking homestead members to identify the clinic they normally use for their PHC needs. These data were entered into the MIS database and updated during 1997 just before this study was undertaken.

### **3.3.1 Preparation of the analytical databases**

The analytical database was developed from information contained in the MIS database. All eight fields contained in the core MIS dataset were included in the preparation of the analytical database.

A second separate database file was created by extracting data on the list of names and geographical positions (latitude and longitude) of all PHC facilities in the study area from the health facility database of all PHC facilities for South Africa obtained from the Provincial Department of Health, Pietermaritzburg. Not all data fields in the analytical databases were used for each of the three broad methodological steps referred to above. For each step a separate database was created from the analytical databases and modified specifically to include new data collected in each step.

The database created for the delineation and comparison of catchment areas for PHC clinics contained data on the geographic positions of the homesteads, the total population in the homesteads, names and geographic positions of the 19 pre-existing PHC clinics. These data were required to identify the locations of PHC clinics in space and to determine the number of the catchment population in these PHC clinics. The same database was used in the comparison of absolute distances between homesteads and PHC clinics before and after the CUBP but the database was modified to include the names and geographic positions of the 16 new PHC clinics that became available after the CUBP. Two fields were added to this database created for this analysis. These fields were used to store the absolute distances calculated for each period. All databases were created within Microsoft Access and the data was imported into MapInfo® GIS software when performing spatial analysis.

### **3.3.2 Limitations of the MIS data**

1. During the clinic utilization survey, not all homesteads were visited as the MIS database includes only 92% of the population of the study area estimated in the 1996 Population Census. The homesteads and population covered in the MIS are those that are located in malaria problem areas and were under malaria surveillance. Therefore data for the town of Jozini and areas in the western parts of the region near Lebombo

Mountains were absent from the MIS database. This is the reason why clinics located in these areas had missing homestead and population data and were therefore excluded in the delineation and comparison of catchment areas for PHC clinics based on distance and usage. Since the MIS was designed for use as a malaria control tool, it was not necessary at the time to include all the homesteads in the area.

2. The data on clinic utilization was intended for malaria control activities since the Malaria Control Programme was being transformed from being a vertical programme to a more integrated set of activities within PHC services offered at the health facilities as part of the DHS. Before this decentralization of malaria control activities could take place, it was therefore necessary for health authorities to establish the proportion of people who were reliant on PHC facilities.

3. Although the focus of this study is on fixed PHC clinics, in the clinic utilization survey the question asked (*which clinic do you normally use for your PHC needs?*) did not specifically differentiate between fixed clinics, mobile clinics and hospitals. This explains why some homestead members identified mobile clinics and hospitals as their regular source of health care. While the MIS database has its limitations, it is nonetheless currently the only source of routinely collected data available for the study area, which provides spatial and attribute information at homestead level.

### **3.4 Study design**

There are a series of methods and techniques that make up the different components of this study rather than a single study design. The methods used in the delineation and comparison of catchment areas for PHC clinics based on distance and usage are descriptive (Grimes & Schulz, 2002; Katzenellenbogen *et al.*, 1997).

In this part of the methodology, the level of accessibility of PHC clinics is described in terms of the distribution of population in catchment areas between 5km distances of all the PHC clinics in the study area with available population data. Analytical techniques are then applied to compare the catchment areas for these PHC clinics by population that utilise the nearest clinic in these 5km distances.

The minimum, maximum and mean distances to PHC clinics before and after the CUBP were then determined and compared as a indication of the level of accessibility of all PHC clinics in the study area for each of the periods before and after the CUBP. This assessment of accessibility also compares coverage of the population by the PHC services between the two periods. An analytical cross-sectional study design was used to compare MCH service utilization and MCH status patterns at different absolute distances from PHC clinics. In this part of methodology the effect of accessibility on MCH service utilization and MCH status indicators was examined by comparing service utilization patterns and health status in homesteads at 5 km incremental distances from the five PHC clinics referred to in the MCH survey.

### **3.5 Delineation of catchment areas for PHC clinics based on distance**

The first broad methodological step i.e. the delineation and comparison of clinic catchment areas based on absolute distance and usage, is described in sections 3.5-3.7. This step is the first level of the measurement of accessibility of PHC services and includes all fixed PHC clinics in the study area. To assess the level of accessibility, the health facility database file containing the names and positions of the 19 fixed PHC clinics in the study area was spatially displayed in MapInfo® GIS software. Catchment areas were created around these PHC clinics using *Triangulate*, a Mapbasic subprogram

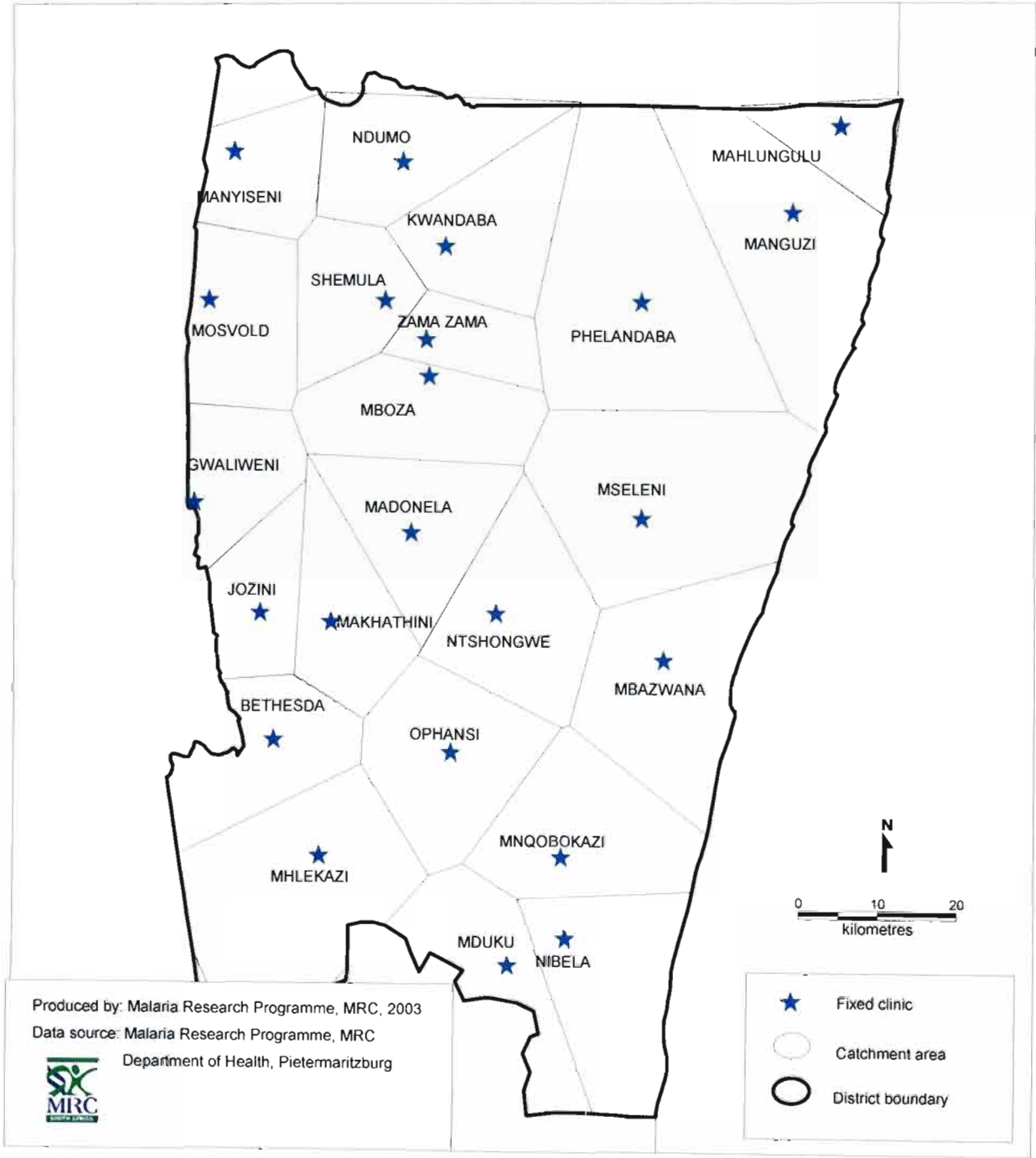
of MapInfo® GIS software. This computer program puts a point at the midpoint of three adjacent clinics. These midpoints were then joined using the *Polygon* tool from the *Drawing Toolbar* menu of MapInfo® GIS software to form Thiessen polygons (or catchment areas based on distance from the nearest clinic) around all PHC clinics (Figure 3.2). These catchment areas based on distance were saved in separate MapInfo® file. After creating the Thiessen polygons, the analytical database file containing 34 326 homesteads (220179 population) was spatially displayed together with the catchment areas for PHC clinics based on distance and the homesteads allocated spatially to catchment area for each PHC clinic.

### **3.6 Delineation of catchment areas for PHC clinics based on usage**

The technique described in this section differs from the one in section 3.5 in that accessibility in section 3.5 is based on absolute distance measured from the nearest PHC clinic and the boundaries for these catchment areas are generated automatically by the computer. Accessibility in section 3.6 is based on actual usage of PHC clinics that homestead members have identified as their source of PHC services in the clinic utilization survey. The boundaries for catchment areas are defined around the population that has identified that particular PHC clinic as the source of health service.

To delineate catchment areas based on usage, the analytical database file containing 34 326 homesteads and clinic utilization data was spatially displayed in MapInfo® GIS software. The *Query* and the *Select* menus of MapInfo® GIS software were used to identify all PHC clinics the homestead members claimed to use for their PHC needs. The identified homesteads were allocated to each PHC clinic, colour-coded and saved to a separate file.

Figure 3.2 Catchment areas for PHC clinics in Umkhanyakude District



Following this, catchment boundaries were manually drawn around each PHC clinic using the *Polygon* tool from the *Drawing Toolbar* of MapInfo® GIS software to form catchment areas for these PHC clinics based on usage. Of the 19 pre-existing PHC facilities in the study area, only 14 were identified by the homestead members within these catchment areas as the actual source of PHC services i.e. Kwandaba, Madonela, Makhathini, Mbazwana, Mduku, Mnqobokazi, Mahlunqulu, Ndumu, Nibela, Ntshongwe, Ophansi, Phelandaba, Shemula and Zamazama. The other five PHC clinics namely Manyiseni, Gwaliweni, Mhlekezi, Mboza and Jozini had missing homestead and population data and were therefore, excluded from the comparison of catchment areas for PHC clinics based on distance and usage discussed in section 3.7.

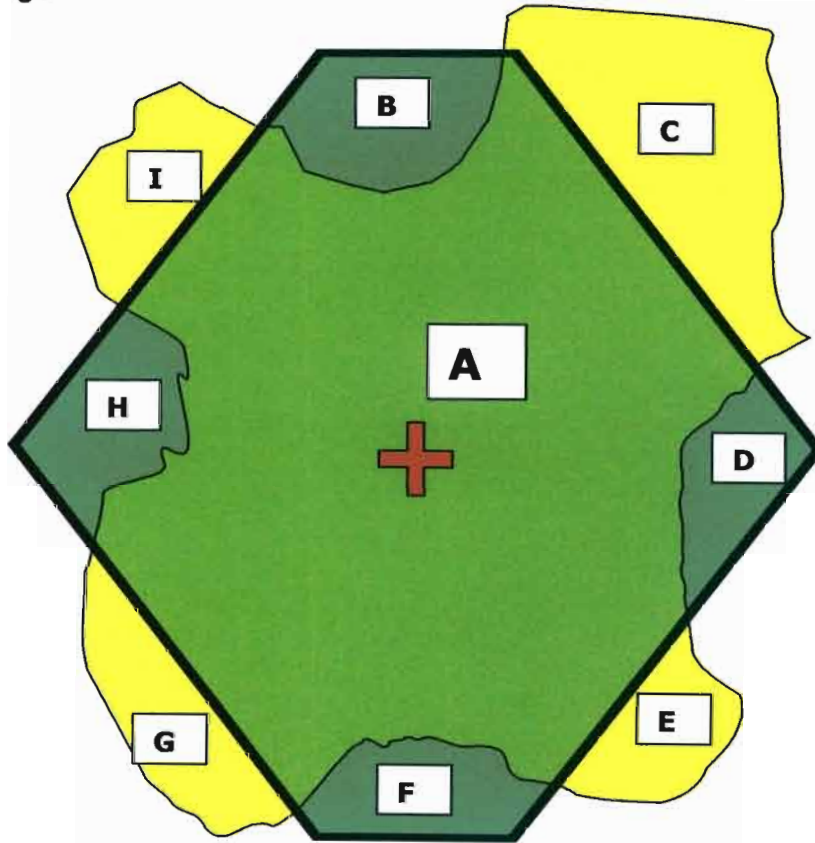
### **3.7 Comparison of catchment areas for PHC clinics based on distance and usage**

The catchment areas for PHC clinics based on distance and usage were compared spatially to determine the degree of overlap for each health facility. The unit of analysis was the total population within the homesteads that fall in areas of overlap between these catchment areas and within various distance ranges in each of these catchment areas. The purpose of this comparison was to determine whether distance provides a reasonable proxy for clinic usage. If the analysis showed a very close overlap between populations in the catchment areas for PHC clinics based on distance and usage for the same clinic, it would suggest that distance is a valid construct for the planning of services for a given population. This exercise provided the first and the most macro level analysis at which the relationship between distance and service utilization was addressed. In this analysis, catchment areas for PHC clinics based on distance and usage with their catchment population were overlaid (represented spatially).



For each of the 14 PHC clinics, the *Select* tool of the *Drawing* toolbar in MapInfo® GIS software was used to identify the population that was using their nearest clinic. This can be simply explained by means of a diagram in Figure 3.3 as follows:

**Figure 3.3 Comparison of catchment areas for PHC clinics based on distance and usage**



Catchment Area based on distance (Thiessen polygon) = A + B + D + F + H

Catchment Area based on usage = A + C + E + G + I

Proportion of the population using the clinic within a catchment area based on distance

$$= \frac{\text{All the Population within Area 'A'}}{\text{All the Population within areas A+B+D+F+H}}$$



The proportion of the population in each of 0-5 km, 6-10 km and >10 km from the clinics were calculated and compared for each of the clinics and for the whole study area between these distances.

### **3.8 Comparison of absolute distances between homesteads and clinics before and after the CUBP**

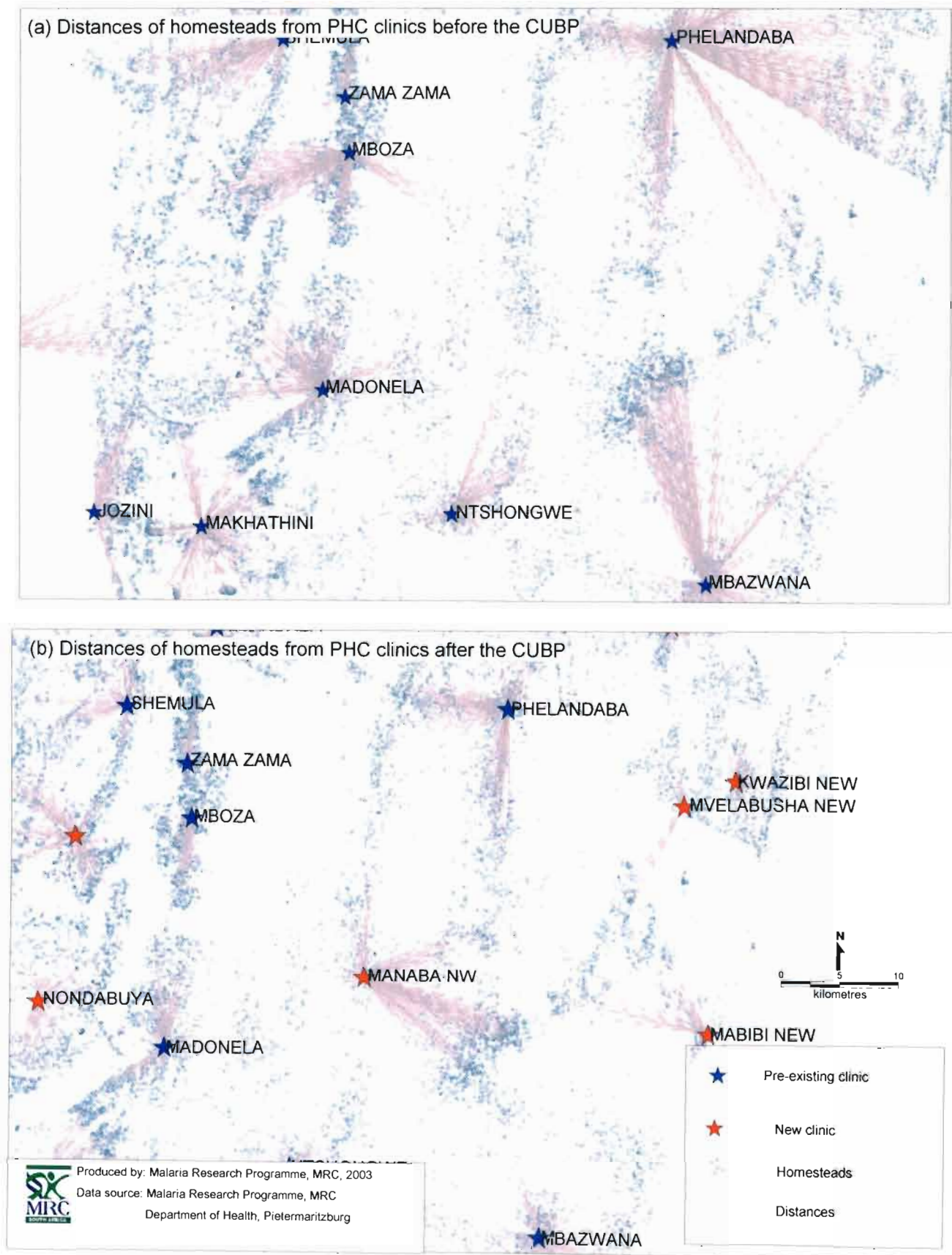
The objective here was to measure changes in the mean distance from fixed clinics to rural populations in the Umkhanyakude District following the introduction of the CUBP since 1994. One of the aims of the South African NHS in this period was to provide access to health services by building more clinics. The implementation of the CUBP has resulted in more than 400 clinics being built and more than 200 being upgraded nationally (Health Systems Trust, 1999). It was expected that the building of clinics would reduce travel distances and increase health service utilization. Although the intention was to measure changes in the entire Jozini/Empangeni Health Region, this was not possible since data on geographical positions for homesteads was only available for the Umkhanyakude District. The other two health districts forming part of Jozini/Empangeni Health Region did not have such data to perform a spatial analysis.

A list of names and geographical positions for the 19 pre-existing PHC clinics and the 16 clinics that became available after the CUBP and geographical positions of the 34 326 homesteads were obtained from the analytical databases. The analytical database containing homestead data was updated by adding two fields to store the calculated distance of homesteads from the clinics in kilometres. One field was used to store distances of homesteads from the pre-existing clinics and the other to store distances of homesteads from all the 35 clinics including the 16 clinics that became available after the CUBP.

The updating was performed using the *Table*, *Maintenance* and *Table structure functions* of MapInfo® GIS software. The *Distance to objects* function in Mapbasic sub-program of MapInfo® GIS software was used to calculate the nearest distance of the 34 326 homesteads from the 19 pre-existing PHC clinics before the CUBP. The same procedure was repeated for all 35 clinics including the 16 clinics that became available after the CUBP (Figure 3.4). Summary statistics were produced using the *Query* and *Calculate statistics* functions in MapInfo® GIS software to determine the minimum, maximum and mean distances each for before and after the CUBP. *Student's t-test* was used to compare the mean distances before and after the CUBP using Epi-Info 6.04b statistical package (Bland, 2000).

The calculation and comparison of distances travelled by homestead members to PHC clinics in the periods before and after the CUBP provided an important description of the distribution of individual homesteads in relation to the clinics that their members claimed to use. It also informed the creation of buffers discussed in the next section and the approach to analysis of these data. It allowed the prediction of available sample size in each of the buffers and guided how many buffers to create and the size of the buffers in order to obtain a true picture of actual practice.

**Figure 3.4 Absolute distances of homesteads from PHC clinics before and after the CUBP in Umkhanyakude District**



### 3.9 Summary

The methods presented in this chapter address (a) the delineation and comparison of catchment areas for PHC clinics based on absolute distance and usage; and (b) the determination and comparison of minimum, maximum and mean distances travelled by household members to PHC clinics in the periods before and after the CUBP. Chapter 3 also describes the study area as essential background for method presented in both chapters 3 and 4. The study area is described in terms of geography and topography; political and social structures; health facilities and infrastructure; social and demographic profiles; economic and health profile of the population. It is evident from this description that the study area is an underdeveloped rural area with high levels of illiteracy, unemployment and poor health profile and health infrastructure. The segment of the population that is highly affected by these unfavourable conditions is women and children who are the majority of the population and one of the main consumers of health care services.

The steps used to measure physical accessibility are presented as a series of analytical methods and techniques that measure absolute distances of homesteads from health facilities. All GIS analysis was carried out using MapInfo® GIS software. In the delineation and comparison of catchment areas for PHC clinics based on distance and usage, two different GIS techniques were applied to define these catchment areas. Computer-generated Thiessen polygons are used to delineate catchment areas for PHC clinics based on distance. Catchment areas for PHC clinics based on usage were defined according to the clinics that homestead members have identified as their source of PHC services. The delineation and comparison of catchment areas for PHC clinics based on distance and usage is intended as the important first step in determining the effect of distance on health service utilization.

This step was performed in order to determine the extent to which the population in the study area did in fact use the nearest PHC clinic and whether distance, therefore, provided a reasonable proxy for health service utilization. Accessibility was also measured by the determination and comparison of minimum, maximum and mean distances travelled by homestead members to PHC clinics in the periods before and after the CUBP. This step provided an important description of the distribution of individual homesteads in relation to the clinics that their members claimed to use. It also informed the creation of distance buffers described in the MCH survey in terms of approach to analysis, sample size and the size of the distance buffers. The creation of distance buffers is described in chapter 4 as part of the third broad methodological step i.e. the comparison of MCH service utilization and MCH status patterns at different distances from PHC clinics.

## CHAPTER 4

### THE MCH SURVEY

#### 4.1 Chapter overview

The discussion in chapter 4 is based on the third broad methodological step i.e. the comparison of MCH service utilization and MCH status patterns at different distances from PHC clinics. This step consists of various methods and techniques described under these headings: sampling, data collection, data entry, data analysis and the analysis of the effect of accessibility on MCH service utilization and MCH status. This analysis includes methods and techniques used to examine distance effects on MCH service utilization and MCH status, which is central to this thesis and attempts to address these three questions:

- Do MCH service utilization patterns vary with increasing absolute distance from PHC clinics?
- Does MCH status vary with increasing absolute distance from these clinics?
- What other factors of accessibility besides absolute distance influence these MCH service utilization patterns and MCH status?

The first of these questions is based on the expectation that under the best of conditions, mothers will attend antenatal care repeatedly during pregnancies, deliver at clinics or other supervised health facilities and attend for family planning services in the two-year period following the birth of their child. In the case of children it was expected that they will attend clinic regularly for vaccination, growth monitoring and health education during the first year of life and for treatment of other incidental and minor ailments during early childhood. Therefore, the hypothesis was that utilization of these services will be negatively affected by increasing absolute distances from clinics.



With regard to the second question the most appropriate indicators of MCH status that might reflect health service inputs would be patterns of maternal, perinatal, infant and child mortality and child morbidity measures such as prevalence of diarrhoeal disease and acute respiratory infections. Maternal and neonatal outcomes are particularly responsive to health service inputs. The enormous sample sizes required to show the impact of different patterns of health service utilization on maternal and child mortality made it impractical to use these outcome indicators for health status assessments in this study. Consequently, anthropometrical status, maternal health knowledge and practices, and morbidity measures such as the prevalence of diarrhoeal disease and acute respiratory infections were used as convenient proxies.

Since absolute distance is not the only determinant of health service utilization and absolute distances may not reliably reflect access to services in many settings, the purpose of the third question was to investigate the role of factors other than absolute distance on measures of health service utilization. Attempts have therefore, been made to determine how people get to the clinic; whether they walk or use other forms of transport and if they walk, how long they take to reach the clinic. Also, question three sought to investigate whether people consistently make use of other health care facilities in the area and what other accessibility factors influence MCH service utilization. The methods and techniques used to answer the above questions are presented in sections 4.2-4.6.

## **4.2 Sampling**

The study design used for the MCH survey was a cross-sectional analytical community-based survey. A community-based study was appropriate as it included all people in the study area including those not regularly attending the PHC clinics.

#### **4.2.1 Sampling of clinics**

Purposive sampling was used to select a cluster of five neighbouring fixed PHC clinics with their catchment populations based on documented usage patterns. These five clinics were selected from an area where there were few mobile clinic points and hospitals adjacent to their boundaries that might introduce facility selection bias or confound the results. The five clinics were selected from the southern part of the Umkhanyakude District between Bethesda and Mseleni hospitals in Ubombo magisterial district (see Figure 3.1). The five clinics selected were Madonela, Makhathini, Ophansi, Ntshongwe and Mbazwana. All five clinics offered a similar range and standard of PHC services namely, well-baby care, antenatal care, maternity services, family planning, chronic illness care and treatment of minor ailments (see Appendix 2).

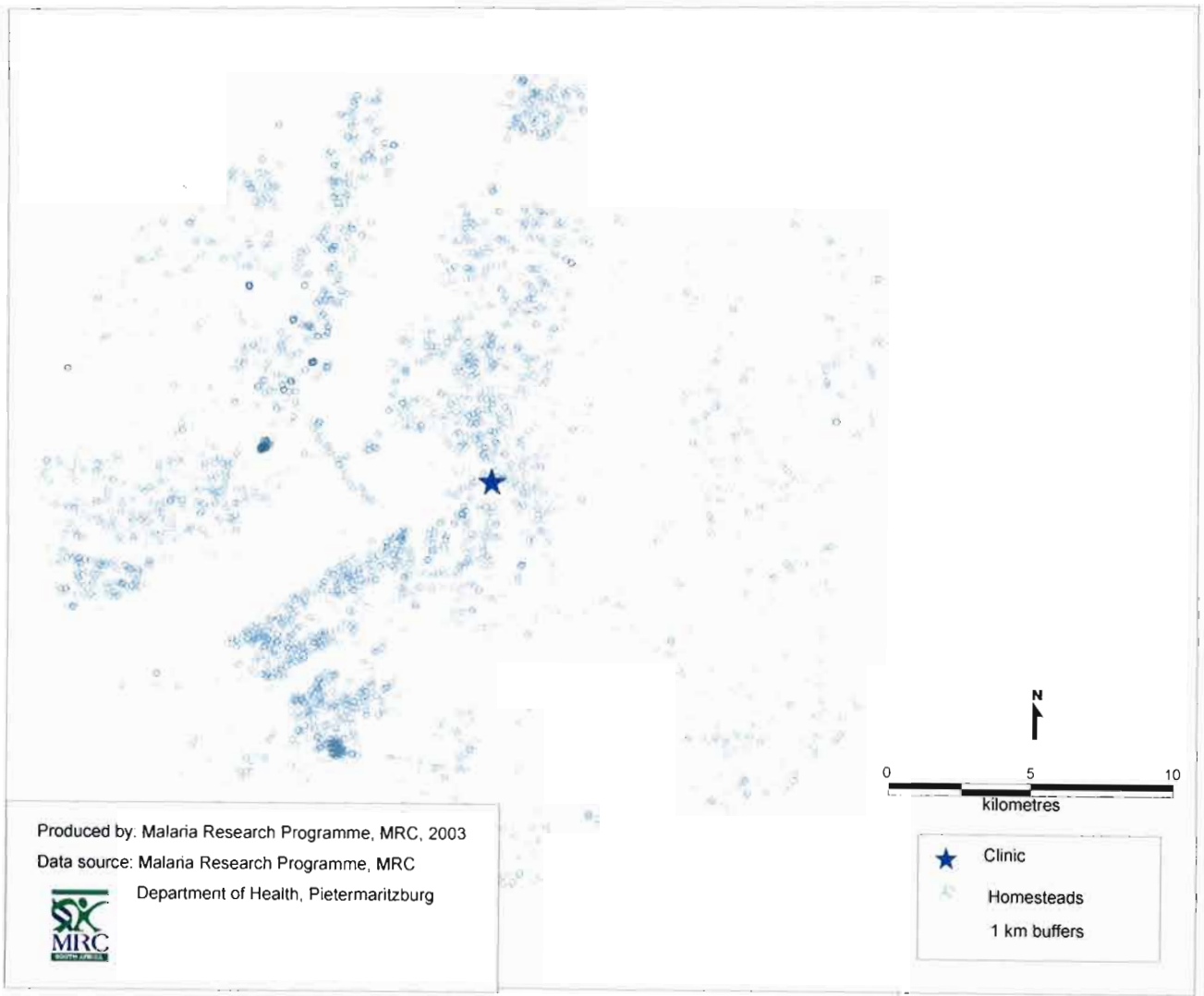
#### **4.2.2 Generation of distance buffers around PHC clinics and sampling of homesteads**

This section provides a basis for random sampling of homesteads in the MCH survey and for analysis of the relationship between accessibility and a number of indicators collected as part of the MCH survey. The creation of distance buffers around clinics directly served the sampling and the analytical needs of the MCH survey. The technique involved generation of 1 km distance buffers around each clinic within a smaller sample of five neighbouring fixed PHC clinics selected above.

The sampling units were homesteads within catchment areas based on usage for these clinics. A data file was created from catchment areas based on usage for each of the five designated clinics. Each of these files was opened separately in MapInfo® GIS software to spatially display the clinic and its catchment population. 1 km distance buffers were created around the clinics using the *Object* and *Buffer* menus of MapInfo® (Figure 4.1).



Figure 4.1 Distance buffers around a PHC clinic



After the generation of distance buffers for each of the five clinics, the data were saved into a file for each clinic and imported into MS Access and then SPSS statistical package for sampling purposes. A stratified random sampling was used to select an approximately 10% representative sample of homesteads from each 1 km buffer in catchment areas for each of the five selected clinics. This resulted in a sample size of 685 homesteads selected from a total of 6 665 homesteads (42 256 population). This sample size was considered to have sufficient power (90%) to determine significant differences between indicators of MCH service utilization and health status at different distances from the clinic with 95% confidence.

#### **4.2.3 Selection of mother-child pairs**

Lists for the 685 sampled homesteads were generated for use during the MCH survey to identify mother-child pairs in the study area. These lists contained data on the homestead owner, area, section, and homestead number. These data enabled the fieldworkers to identify the homesteads during the fieldwork. The respondents sampled for the MCH survey were mothers of children aged 12-23 months who were resident in Ubombo magisterial district during the study period. The presence of children aged 12-23 months irrespective of whether the biological mother is alive or deceased, was therefore the primary selection criterion in identifying mother-child pairs within each homestead.

Since outcomes of interest from a child health point of view were utilization of routine services in infancy, such as for vaccination and growth monitoring, and the determination of growth and morbidity patterns during the first year of life, the age group of 12-23 months, for which these activities are likely to have been completed, was selected.

This provided the opportunity to concurrently determine utilization patterns for antenatal care, delivery, and family planning services for their mothers. The linkage of mothers to preschool children aged 12-23 months made it possible to:

- Establish retrospectively the health service utilization patterns and the health status of young children during the completed first year of life. This is the time when risks for morbidity and mortality are highest and attendance at clinic for preventive care is most critical.
- Access RTHCs most reliably and thereby provide objective evidence of clinic attendance, growth monitoring and vaccination coverage, conveniently perform anthropometrical assessment of the selected children.

Women in this category are also sufficiently close to the pregnancy to recall pregnancy-related events. It has also been shown in previous surveys (Damman *et al.*, 1990; Dammann & Solarsh, 1992; Wilkinson *et al.*, 1997a) that the vast majority of mothers can produce RTHCs for children of this age and this therefore furnishes a source of objective health status and health service utilization data. The MIS database did not contain pre-existing demographic data on households, although demographic data formed a basis for homestead selection. Since homesteads were initially sampled in the absence of any knowledge about age breakdown of its members, a number of the sampled homesteads did not have children of the required age.

In the absence of children aged 12-23 months, fieldworkers were required to move to the nearest adjacent homestead and to repeat this process until a homestead with a child of the required age was found. The preferred respondent in each case was the mother of the child if was still alive. If the mother was deceased the primary caregiver of the child was interviewed. If the mother/caregiver was absent but was not a migrant (expected to return at sometime within a week of the first visit), fieldworkers were

required to revisit the homestead to conduct the interview with the mother/caregiver at a time when she was expected to be present. Other reasons for revisits were the absence of the index child or a RTHC at the time of the visit. If the child was unlikely to be available within one week of the first visit, another mother-child pair was selected from a nearby homestead. If the mother was unlikely to be available, the interview was conducted with the primary caregiver such as the granny, the stepmother or aunt. Only one mother-child pair was included from each selected homestead. If there were more than one child in the household, the names of the children were written on pieces of paper and put in a plastic bag and then selected one name randomly.

### **4.3 Data collection**

Each of the methods and techniques used in the data collection is discussed in the following sections in terms of the questionnaire design; fieldworker selection, training and pilot study; administration of the questionnaire; transcription of data from RTHC; anthropometric measurements and homestead mapping using GPS.

#### **4.3.1 Questionnaire design**

The questionnaire consisted of six sections (see Appendix 3). Section one contained general information about the interviewing team, the area and section in which the clinic was located and date of data collection. The second section collected demographic and social data on the respondent such as age, school attendance and the relationship of the caregiver with the child. Then followed an assessment of the clinic regarding availability of MCH services; health education and health promotion in support of breastfeeding practices. This section included data on availability of transport to the clinic, fares, travel duration and mode of transport.

Availability of other services and facilities such as hospitals and mobile points, shops and schools and community health workers (CHWs) was also determined. The last part of section three required respondents to comment on the clinic services so as to determine the quality of the clinic services. Part four of the questionnaire sought data on maternal health service utilization patterns. Section five posed questions about child health service utilization patterns and child health status.

The concluding section aimed to determine the socio-economic status of the homestead members. Socio-economic status indicators measured from this study were percentage of school-age children who were attending school; presence of a pensioner and migrant worker as a source of income; house type; wealth indicators such as ownership of a television set, radio, car, furniture and fridge. None of the data collected permitted an evaluation of the quality of services at each PHC clinic. Data on the convenience of travel were limited to identifying the mode of transportation, amount paid and an estimation of the time taken to reach the clinic.

#### **4.3.2 Fieldworker selection, training and pilot study**

Before the household survey was undertaken, five fieldworkers were recruited from the Durban region during February 1998. Together with the researcher, these fieldworkers underwent one-week training in March 1998 with a professional trainer from the Department of Nutrition, University of Natal, Pietermaritzburg. The training sessions involved interviewing skills using the questionnaire, understanding the questionnaire content, weighing babies using hanging scales, measuring babies' length using measuring boards. The training included practical sessions at the Outpatient Paediatric Ward of the nearby King Edward VIII Hospital in Durban. During this period a GIS specialist also trained the fieldworkers on how to take the position of each homestead using a handheld battery-operated Global Positioning System (GPS).

Prior to commencing fieldwork, ethical approval to carry out the study was obtained from the University of Natal, Medical School Ethics Review Committee. After development of the questionnaire and training of the fieldworkers, a pilot study was undertaken in the field during April 1998 on a small sample of 75 homesteads. The pilot phase was undertaken to determine any methodological and logistical requirements of the fieldwork. Following the pilot study the questionnaire was revised accordingly to include changes determined during this phase of the study.

#### **4.3.3 Administration of the questionnaire**

Quantitative data was collected directly with a personally administered questionnaire (see Appendix 3 for the sample) in face-to-face interviews with mothers/caregivers of children aged 12-23 months within each homestead. The field data collection took place from 01 June 1998 to 15 August 1998. There were three field teams each comprising two fieldworkers, one driver of the four wheel drive vehicle and a surveillance agent from the Malaria Control Programme. The surveillance agent assisted the field team to identify the sampled homesteads within the catchment area for each clinic and introduced the field team to the homestead head according to the local custom.

In the case where a child of the required age was not found within the selected homestead, the nearest homestead in any direction from the randomly selected homestead was visited. During each homestead visit, the two trained fieldworkers interviewed the mother, weighed the child, recorded information from the RTHC and took co-ordinate points of the geographical position of each homestead using a GPS instrument. Each homestead interview took about 20 minutes to complete. This time included five minutes of taking anthropometric measurements and gathering data from the RTHC.

The homestead was re-visited if the mother, the child or both were not present on the day of the first visit, except where the mother was away for more than two weeks. In the case where the mother had died, or the child was abandoned and left to be raised by other family members, the primary caregiver of the child was interviewed on sections one to two and five to six of the questionnaire which were specifically created to cater for these circumstances.

All questionnaire forms were checked daily for accuracy, completeness and consistency by the researcher. Out of the 685 homesteads identified in the sampling frame, 652 were completed. Thirty-three homestead members refused to be interviewed. Out of these 33 homesteads, 29 belonged to section four of Mphakathini and section five of Mbazwana areas in the catchment area for Mbazwana Clinic. The remaining four belonged to the catchment area for Ntshongwe Clinic. Out of the 652 completed questionnaire forms, six were excluded as non-respondents because they had incomplete data. The total number of completed questionnaires that were used in the analysis was 646 and each questionnaire represented one mother-child pair from one homestead.

#### **4.3.4 Transcription of data from RTHC**

While one field worker interviewed the mother of the child, the other recorded data relevant to the study from the RTHC (see Appendix 4 for a sample of RTHC). The RTHC is the only on-going and consistent link between different health workers and those caring for the child. Therefore, RTHC is the easiest and quickest tool available for routine and regular growth monitoring for early detection of disease and nutritional problems in children (Department of Health, 1995b). Information collected that was relevant for this study was the date of birth of child, the place of birth, birthweight, date of each



vaccination, the type of vaccines given, clinic attendance for growth monitoring and treatment of minor ailments, and the types of minor ailments the child had suffered in the first year of life. Although fever and cough may be symptoms of the same illness, these symptoms were recorded separately to analyse symptoms that would make the child seek curative care. Since this approach was consistently applied for all minor ailments it is not expected to bias the relationship between individual minor ailments and distance of between homesteads and clinics. All these data were recorded on section five of the questionnaire and a prepared copy of the RTHC.

#### **4.3.5 Anthropometric measurements**

In order to collect data to evaluate the health status of children, anthropometric measurements were taken. The current nutritional status of the child was determined by physical measurements of length and weight. These data were recorded on section five of the questionnaire.

##### **4.3.5.1 Measurement of the child's weight**

The body weight of each child was measured using Salter hanging scales (maximum capacity 25 kg). The scales were standardized with objects of known weight at the start of each day in the field and during fieldwork. The children were weighed without any clothes on. Weights were measured to the nearest 0.1 kg.

##### **4.3.5.2 Measurement of child's length**

The child's length was measured using portable plywood measuring board, mounted on a right-angled base and fitted to measure recumbent length in children aged less than two years. These measuring boards were specifically designed for this survey and were not commercially manufactured measuring boards.



The child's length was measured with the child lying down. The measurement procedure involved two people. The head of the child in the Frankfurt plane was placed against the fixed headboard. The child was gently stretched in a straight line and contact of shoulders, buttock, calves and heels with the board ensured. Care was taken to keep the knees straight. In this position the footboard was slid along the board until it made contact with the soles of the feet at right angles to the lower leg. The length was read off the scale on the measuring board in centimetres to the nearest 0.1 cm.

#### **4.3.6 Homestead mapping using GPS**

This exercise was necessary to include the geographical positions of those homesteads of people who have settled in the study area after the initial mapping of the homesteads was done in 1996 and were therefore not in the MIS database. The homesteads were mapped during the fieldwork with a battery-operated hand-held standard GPS. A GPS is an electronic device that makes use of satellite technology to geo-reference (allocate a geographical position) a specific location on earth (Hurn, 1989; Trimble Navigation, 1993).

*Trimble Navigation Ensign*® GPS's were used to record the geographical position (latitude and longitude coordinates) for each homestead. The GPS was calibrated using trigonometric beacons. The accuracy of the *Ensign*® GPS is 25 to 100 m root mean square on the ground (Trimble Navigation, 1993). The geographical position data thus captured were imported into MapInfo® GIS software and a map of the homesteads was created using *Table* and *Create points* functions.

#### **4.4. Data entry**

Microsoft Access software is a relational database that allows the linkage of spatial data to their attribute data and was used in the data entry process. After all the questionnaires from the MCH survey were checked and edited, a data input form was designed within Microsoft Access 97 (version 7) software by a data administrator in consultation with the researcher and the co-supervisor. Advice from a qualified biostatistician and a database manager, all employed by the MRC was sought. The data were double captured by both by the researcher and the data administrator. After the data were compared, verified and validated, they were then imported into the MapInfo® GIS software for spatial analysis and production of maps. For statistical analysis, data was imported into Epi-Info 6.04b statistical package.

#### **4.5 Data analysis**

The researcher used Epi-Info 6.04b statistical package to analyse the MCH survey data in consultation with a statistician. The variables of interest were the response rate, characteristics of the mothers and children, distance from clinic, indicators of MCH service utilization and MCH status and indicators of MCH-related health knowledge and practices. These variables were analysed as described below.

##### **4.5.1 MCH service utilization patterns and MCH status**

The researcher used Epi-Info 6.04b statistical package to produce simple descriptive statistics (frequencies and percentages) of the response rate, the general and key characteristics of the study subjects and households and the MCH service utilization patterns and MCH status.

#### **4.5.2 Socio-economic factors**

Five indicators could be derived from the study sample namely, the percentage of school age children who were attending school; source of income; house type; wealth indicators and source of water. The percentage of school age children who were attending school is an indicator of the parents' ability to afford education of their children (Dennill *et al.*, 1999). The source of income was measured by the presence of a pensioner or a migrant worker (any employed person) in the homestead and whether these were assisting to support the family financially or by providing for other domestic needs.

House type was classified according to the type of material the walls were made of, the type of roofing and the presence of windows. The mud-and-stick walls with thatched roof structures were classified as traditional. The structures made of brick; cement or concrete walls with tin or tiled roof with windows were classified as modern. The number and type of housing were counted per homestead. These were then converted into percentages. For analysis purposes the status of the house was classified into five groups depending on the percentage, that is, a higher percentage of traditional houses (lower percentage of modern houses) represented a lower socio-economic status.

Alternatively, a higher percentage of modern houses represented a higher socio-economic status. The wealth indicators that have been used were the ownership of a car, a TV set, a fridge, furniture and a radio. The wealth status of the homestead members was categorized into five groups indicating a progression from less wealthy to more wealthy based on the number and type of material possession. The source of water was classified as clean and unclean. A clean source of water refers to taps inside and outside the homestead structure, communal taps, wells or tanks. An unclean source of water refers to rivers, streams, lakes or ponds.

### **4.5.3 Calculation of anthropometric indices**

Three anthropometrical indices, namely weight-for-age (WFA), length-for-age (LFA) and weight-for-length (WFL) were derived from weight and length measurements and used to classify children into three categories of undernutrition. Children less than two standard deviations below the median using reference growth standards were considered 'underweight', while those with equivalent deficits based on LFA and WFL were considered 'stunted' and 'wasted' respectively (WHO/UNICEF, 1989).

This classification is widely used in anthropometrical surveys in developing countries. These indices are routinely derived using the *Anthropometry* programme incorporated into Epi-Info 6.04b statistical package. In each distance buffer children were categorized by anthropometrical sub-category (WFA, LFA and WFL) into those greater than or those less than two standard deviations below the median value and proportions above and below two standard deviations were compared between different distance buffers.

## **4.6 Analysis of the effect of accessibility on MCH service utilization and MCH status**

This section forms the main outcome of interest for the entire study and describes the final part of the comparison of MCH service utilization and MCH status at different distances from PHC clinics. Accessibility referred to here was measured in terms of absolute distance and other factors of accessibility such as mode of transport, maternal age and education, parity, child sex and regular visit by a CHW. Absolute distance was defined by 1 km buffers around the five PHC clinics and from which the MCH survey homesteads were sampled. The analysis of the effect of absolute distance and relative distance is described in the following separate sections.

#### **4.6.1 Effect of absolute distance on MCH service utilization and MCH status**

The 1 km buffers created around the five clinics were grouped into larger categories of 0-5 km, 6-10 km and > 10 km. In order to determine the effect of absolute distance on MCH service utilization and MCH status, the researcher performed *Chi-squared tests* on the number of positive responses to questions relating to the indicators of MCH service utilization and MCH status by distance categories using Epi-Info 6.04b statistical package. Statistical significance of the results was determined at 5% probability levels (p-values less than 0.05). *Chi-squared for linear trend* operations were performed to determine whether there were any trends in MCH service utilization and MCH status between categories of increasing distance (Bland, 2000).

#### **4.6.2 Effect of other factors of accessibility on MCH service utilization and MCH status**

The analysis of the effect of other factors of accessibility such as maternal age, parity, maternal education, mode of transport, child's sex and visit by CHW on MCH service utilization and MCH status was performed using Chi-squared tests in Epi-Info 6.04b statistical package. The analysis was performed to serve two purposes. The first purpose was to determine whether these factors were potential confounders for distance effects on MCH service utilization and MCH status. The second purpose was to use these factors as independent variables to determine whether these factors on their own would affect MCH service utilization and MCH status.

To adjust for the effect of potential confounders, a stratified Mantel-Haenszel analysis was used (Bland, 2000; Kirkwood, 1988). This means that Chi-squared tests were performed between absolute distance and the indicators of MCH service utilization and MCH status, but adjusted for each of these potential factors of confounding. Before analysis all the factors were grouped into two levels as follows:

- Distance (exposure variable) - far ( $>5$  km) and near ( $<5$  km)

Potential confounding variables/independent variables:

- Maternal age - young ( $<35$  years) and old ( $>35$  years)
- Parity - Uniparity (one birth) and multiparity (more than one birth)
- Child's sex - boy and girl
- Maternal education - functionally illiterate ( $< 7$  years schooling) and literate ( $> 7$  years schooling)
- Mode of travel - walk and transport
- Visit by CHW - yes and no

A variable was regarded as a confounder if the risk ratio (RR) i.e. the ratio of the proportions of MCH service utilization and MCH status indicators (outcome variables) in the exposed (far) and the non-exposed (near) survey respondents analysed without the confounder (crude RR or CRR) was different to the adjusted RR (ARR) obtained by adjusting for the confounder. If the CRR was similar to the ARR, then no confounding was found.

If the RRs obtained between different levels or strata of each confounding variable were significantly different (test for homogeneity), this would suggest that the effect of distance on MCH service utilization and MCH status was modified by the stratum of the potential confounder (interaction) (Bland, 2000; Katzenellenbogen *et al.*, 1997). The potential confounding variables were also used as independent variables to determine the effect of each variable on MCH service utilization and MCH status. This analysis used Chi-squared tests as described for the assessment of the effect of absolute distance on MCH service utilization and MCH status.

## 4.7 Summary

Chapter 4 describes various methods and techniques used in the comparison of MCH service and MCH status at different distances from PHC clinics. These methods and techniques are described under the main headings of sampling, data collection and data analysis, including analysis of the effect of accessibility on MCH service utilization and MCH status. The sampling for MCH survey involves sampling of clinics, generation of buffers around clinics and sampling of homesteads and mother-child pairs.

Collection of MCH survey data describes the questionnaire design and administration, fieldworker selection and training, transcription from RTHC, anthropometric measurements and homestead mapping. Data analysis for the MCH survey includes statistical procedures used to determine MCH service utilization and MCH status patterns. The analysis of the effect of accessibility on these indicators is discussed in terms of absolute distance and other factors of accessibility such as maternal age, maternal education, parity, mode of travel, child's sex and visit by CHW. Absolute distance is defined from 1 km distance buffers created around the five selected PHC clinics. These other factors were used to adjust for potential confounding of the effect of absolute distance on MCH service utilization and MCH status and to measure their effect on these indicators as independent variables. The discussion of the results is presented in chapters 5 and 6.

## **CHAPTER 5**

### **RESULTS AND DISCUSSION 1**

#### **5.1 Chapter overview**

The results section of this thesis has been divided into two chapters. Chapter 5, the first of these two chapters, begins with a general description of the study subjects in the MCH survey, their geographical distribution in relation to health facilities in the study area and the main mode of transport between their homesteads and the local fixed PHC clinic. In addition, since home visits by CHWs may influence health-seeking behaviour, a brief description of CHW visitation patterns is provided as part of this initial description of the subjects and their households.

This is followed by a description of some key subject characteristics, household socio-economic status and, of special pertinence to this thesis, MCH service utilization patterns and MCH status in the study area. These descriptions are provided for the study area as a whole and do not take distance from clinic into account. This provides an important backdrop to the analysis of the effect of distance on MCH service utilization and MCH status patterns that are presented in chapter 6. In Chapter 6, attention is given to an exploration of spatial relationship between homesteads and the fixed PHC clinics in the study area and, more specifically, to the effect of different absolute distances of homesteads from these clinics on service utilization and the health status of women and children in the study area.



## **5.2 Study subjects and households**

In order to understand the study subjects, this section provides a descriptive account of a range of background information. This is presented under the headings of study subjects, homestead distribution in relation to clinics, mode of travel and homestead visit by CHW.

### **5.2.1 Study subjects**

In total 646 out of 685 homesteads were successfully visited resulting in a response rate of 94.3% of mother-/caregiver-child pairs. Of these 646 mothers/caregivers, 622 (96.3%) were mothers of the children and the remainder comprised either a grandmother or other family member who has raised the child in the absence of the biological mother. Seventy-six percent of women were designated as the primary daily caregiver of their children. Where this was not the case, the grandmother was the usual alternative (13%).

A smaller number of children was looked after by other family members, non-family members and siblings. The fact that the mother was the direct respondent in over 96% of interviews reflects the survey requirement that wherever possible mothers should be actively sought out and interviewed. It also reflects the fact that the vast majority of women, though they may not be present at first visit; are available in reasonable proximity to the homestead and suggests that there is a very low migrancy rate amongst women in this area.

### **5.2.2 Homestead distribution in relation to health facilities**

The sample of homesteads was unevenly distributed between the five catchment areas of Madonela, Makhathini, Mbazwana, Ntshongwe and Ophansi Clinics (Table 5.1). Nine percent of homesteads fell within the catchment area of Ntshongwe Clinic, while

31.1% fell in the catchment area of Makhathini Clinic. The difference in distribution is due to the fact that the total size of the catchment area of Ntshongwe Clinic was smaller than catchments areas of the other four clinics and that the 9.3% was proportional to the relative contribution of the population in that catchment area to the total population under study.

**Table 5.1 Distribution of homestead sample in catchment areas for PHC clinics**

Clinic	No	%
Madonela	110	17
Makhathini	201	31.1
Mbazwana	119	18.4
Ntshongwe	60	9.3
Ophansi	156	24.1
<b>All clinics</b>	<b>646</b>	<b>100.0</b>

The distribution of homesteads in relation to the clinics is shown in Table 5.2. The distances of homesteads from clinics ranged from 0 to 16 km. Forty-four percent of homesteads were located 5 km from the clinic. This left more than half of the respondents at a distance greater than 5 km limit, the distance traditionally set as an acceptable walking distance for users of PHC services (WHO, 1981, Dennill *et al.*, 1999). If the majority of people in this area were accessing clinics on foot and there is any validity in this distance threshold, a progressive fall off in health service utilization could be anticipated with increasing distance beyond 5 km. Assuming that poor MCH service utilization is associated with adverse health outcomes and poorer health status of mothers and children, it could be expected that these variables would worsen with increasing distance from clinics.

**Table 5.2 Homestead distribution in relation to PHC clinics**

Distance from clinic	No	%
0-5 km	285	44.1
6-10 km	259	40.1
>10 km	102	15.8
<b>Total</b>	<b>646</b>	<b>100</b>

### 5.2.3 Mode of transport

Just over 50% of the respondents regularly walked to the clinic and 47.6% were reliant on transport to get to their clinic. Sixty-six percent of the respondents mentioned that they reached their clinic within one hour of travelling irrespective of the mode of transport, 28.3% said within more than one hour and the remainder could not remember how long it took them to reach the clinic. Results based on time taken to get to the clinic were not reliable since most respondents could not exactly remember how long it took them to reach their clinic. Therefore this variable was not used in further analysis of accessibility.

### 5.2.4 Community health worker (CHW) visit

Approximately 80% of homesteads were regularly visited by the CHW on one or more occasions. Over 50% percent of these homesteads were visited at intervals of 3 months. The remaining homesteads were visited at intervals of 4 or more months (Table 5.3). More discussion about CHW visit will be presented in chapter 6 when the relationship between absolute distance and MCH service utilization and MCH status is examined and potential factors of confounding for this relationship are also explored. The reason for presenting these data on CHW visit is that there was a concern that regular visits by CHW may confound this relationship.

**Table 5.3 CHW visit**

<b>Date of last visit</b>	<b>No</b>	<b>%</b>
0-1 month	211	33.9
1-3 months	107	17.2
4-6 months	42	6.8
> 6 months	169	15.0
DK/NR	93	27.2
<b>Total</b>	<b>622</b>	<b>100</b>

## 5.3 Subject characteristics

This section provides a description of selected maternal characteristics that have been shown to influence pregnancy outcome and infant and child survival in developing countries. These variables include maternal age and education, parity, gravidity and birth intervals.

### 5.3.1 Maternal age and maternal education

The mean maternal age was 28.2 years and the median age was 27 years. The ages were well distributed throughout the reproductive age range, peaking as expected between 20 and 30 years (53.1%). Fifteen percent of these mothers were under the age of 20 years. A very small percentage of the respondents did not know their age (Table 5.4).

Of the 646 respondents, 33.0% had received secondary level of education (Table 5.5). The remainder can be classified as illiterate if a definition by the Education Foundation (2000) of functional illiteracy is used. Functional illiteracy is defined as those adults 20 years and older who have seven years of schooling or less. The functional illiteracy rate based on this definition is 67.0% in this sample and it is regarded as high.

The finding agrees with previous reports that the Umkhanyakude District is rated among the districts with the highest level of functional illiteracy in South Africa (Statistics South Africa, 1991; 1996; The Education Foundation, 2000). Since maternal education is likely to influence the relationship between distance and MCH service utilization and MCH status, more discussion on this variable will be presented in chapter 6 when this relationship is examined in relation to MCH service utilization and MCH status.

**Table 5.4 Age distributions of mothers**

Age group	No	%
15-20	93	15.0
21-30	330	53.1
31-40	157	25.2
41-50	26	4.2
Unknown	16	2.6
<b>Total</b>	<b>622</b>	<b>100</b>

**Table 5.5 Maternal education**

Educational level	No	%
None	196	30.3
Primary	237	36.7
Secondary	213	33.0
<b>Total</b>	<b>646</b>	<b>100</b>

### **5.3.2 Parity, gravidity and birth interval**

Parity refers to the number of births and gravidity refers to the number of times a woman has been pregnant irrespective of outcome. The relationship between parity and gravidity provides a very rough measure of pregnancy outcome.

A woman who has high gravidity and low parity has had significant foetal losses i.e. miscarriages or stillbirths. The results show a similar pattern of parity and gravidity with more than 40% of the women having a parity and gravidity four and above (Table 5.6). The results also show that parity is in excess of gravidity suggesting that these women have not had significant numbers of miscarriages or stillbirths. It also suggests that there have been a number of multiple pregnancies in the sample to explain the excess of parity over gravidity.

**Table 5.6 Parity and gravidity**

Frequency	Parity		Gravidity	
	No	%	No	%
1	145	23.3	133	21.4
2	101	16.2	99	15.9
3	108	17.4	103	16.6
4	101	16.2	93	14.9
5	52	8.4	56	9.0
5+	115	18.5	138	22.2
<b>Total</b>	<b>622</b>	<b>100</b>	<b>622</b>	<b>100</b>

The recommended average birth interval or birth spacing is a period of two years or more and appropriately spaced births of children reflect utilization of family planning services. Average birth intervals were calculated for every woman by determining the time between the first and the last pregnancy and then dividing this by the number of pregnancies minus one. This value was calculated for 452 women as 170 women could not remember the date of birth of their first-born child or could not produce proof of birth. The large number of women (90.9%) with an acceptable average birth interval of greater than two years suggests that there is a high uptake of contraception and good health education in the area.

## 5.4 Socio-economic status indicators

Five socio-economic status indicators could be derived from the study sample namely school attendance rates (Dennill *et al.*, 1999); source of income as defined by the presence of a pensioner or a migrant worker; house type defined as traditional (mud-and-stick) or modern (modern with windows); wealth indicators (radio, furniture, fridge, TV set and car) and source of water (Table 5.7).

**Table 5.7 Socio-economic status indicators**

Indicator	No	%
School attendance rates	196	30.2
School non-attendance rates	450	69.8
Presence of pensioner-related salary	244	37.8
Absence of pensioner-related salary	402	62.2
Presence of worker-related salary	371	57.4
Absence of worker-related salary	275	42.6
Traditional house type	515	79.7
Modern house type	131	20.3
Less wealth indicators	409	63.3
More wealth indicators	237	36.7
Clean source of water	255	39.5
Unclean source of water	391	60.5

### 5.4.1 School attendance rates

Table 5.7 shows that the majority of homestead members were not able to educate their school age children (69.8%). The results are consistent with those published by the Education Foundation (2000) that the highest school non-attendance rates in KwaZulu-Natal province are found in the Umkhanyakude District.

This does not come as a surprise as the ability to educate a child has been shown to be directly related to the households' income or socio-economic status. The reasons for parents not being able to educate children were that parents could not afford to pay for school fees and that the children were required to assist their parents with domestic or farm work (Derman & Poultney, 1989; The Education Foundation, 2000).

#### **5.4.2 Pensioner salary-related income**

The two most important sources of income for most rural areas in South Africa are remittances from migrant labour and monthly pension grants. Table 5.7 shows that 402 (38.2%) respondents mentioned that there were no pensioners living in their homesteads. However, 57% of respondents mentioned that there was someone who was employed or a migrant worker in their homesteads. Of those with either source of cash or other payments in kind income, 66.7% stated that they derived economic assistance from their source in the form of money, food, clothes or contribution towards school fees.

#### **5.4.3 House type and household wealth indicators**

Approximately 80% of the respondents lived in traditional housing (Table 5.7). The results also show that only 36.7% of homesteads can be classified as relatively well off since they possessed household assets such as a radio, furniture, a fridge, a TV set and a car. Furniture refers to possession of any chairs, tables, beds and cupboards. The remaining majority (63.3%) did not have these possessions.

#### **5.4.4 Source of water**

The majority of the respondents (60.5%) mentioned that their homesteads obtained water for domestic consumption from an unclean source of water (Table 5.7). These people obtained their water from rivers, canals, lakes or various other unprotected



sources, which they also share with livestock. More than 90% of the people who used water from the unclean source resided within Madonela and Ophansi clinic catchments, whereas this affected less than half of the people in the other three clinic catchments.

The remaining 40% of the total homesteads obtained their water from a clean source such as inside taps, communal taps or tanks. Tap water located inside the homes was available to a minority of people living in the Makhathini Irrigation Scheme area.

## **5.5 Maternal health service utilization patterns**

While the aim of the study is to relate accessibility to MCH service utilization and MCH status, it is important to provide an initial overview of MCH service utilization patterns and MCH status in the study population as a preamble to exploring its relationship with accessibility. The MCH service utilization and MCH status patterns are important general indicators that are used to monitor health status and health service activity in rural populations. The indicators of maternal health service utilization used in this study were the rates of ANC attendance, the number of deliveries at health facilities and utilization of family planning service. These indicators are described below to provide an understanding of maternal health service utilization patterns.

### **5.5.1 Antenatal clinic (ANC) attendance**

Virtually every woman surveyed (99.8%) had attended ANC on one or more occasions during her pregnancy with the index child. Similarly, high ANC attendance rates were noted in the Limpopo province (Uyirwoth *et al.*, 1996) and in Gelukspan health ward (Ferrinho *et al.*, 1991). As expected the vast majority of the women surveyed (82.8%) received their ANC at fixed clinics. The remainder attended mobile clinics or local hospitals for this service (Figure 5.1). This confirms that the vast majority of South African women, even in the remote rural parts of this country, choose to attend for

It also confirms that this is a service for which attendance at a nurse-run clinic is considered to be adequate and that this reflects the views of both providers and consumers (DNHPD, 1991; Ferrinho *et al.*, 1991; O'Mahony & Steinberg, 1995). Of interest is the fact that almost 10% of women attended at facilities outside the local health district. This reflects periods of temporary residency outside the district when they were employed or visiting their spouses or relatives.

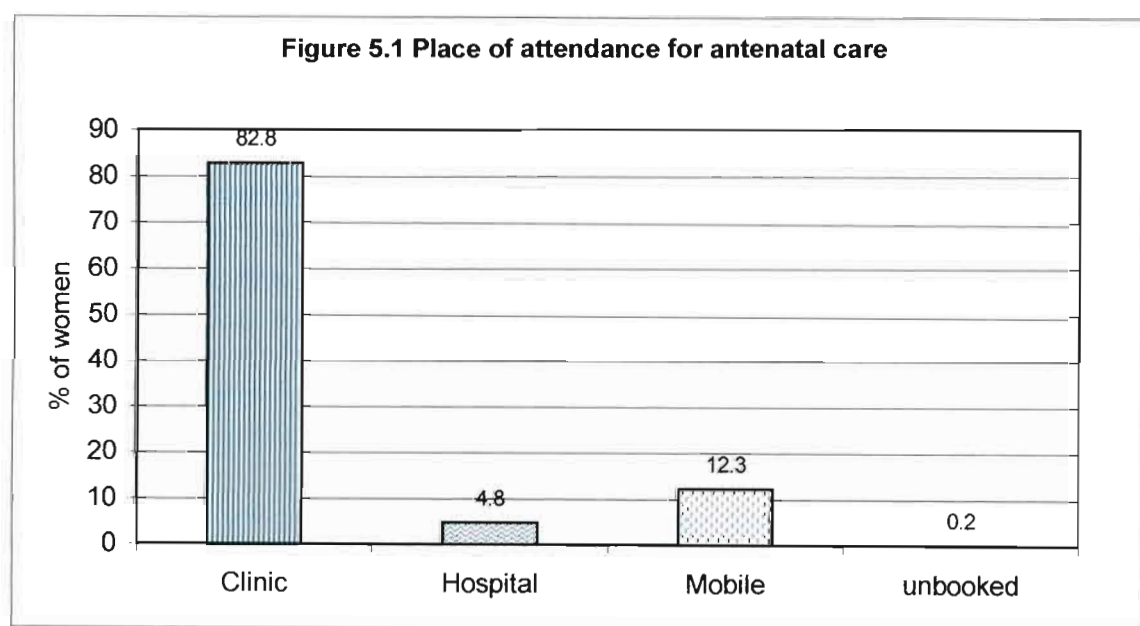


Figure 5.2 shows the percentage of women attending ANC for the first time during their pregnancy. Most women (91%) attended ANC for the first time in the first and second trimester. Very few women (6.4%) attended late in the third trimester and a negligible percentage of women were unbooked. The findings are consistent with the findings of Knight (1998) for the same area and those of Wilkinson *et al.* (1997a) in the Hlabisa district, another rural setting about 200 kilometres from the study area. The results are in contrast to those described by Westaway *et al.* (1995) for an informal settlement in Gauteng province where the majority of the women attended ANC late in their pregnancy.

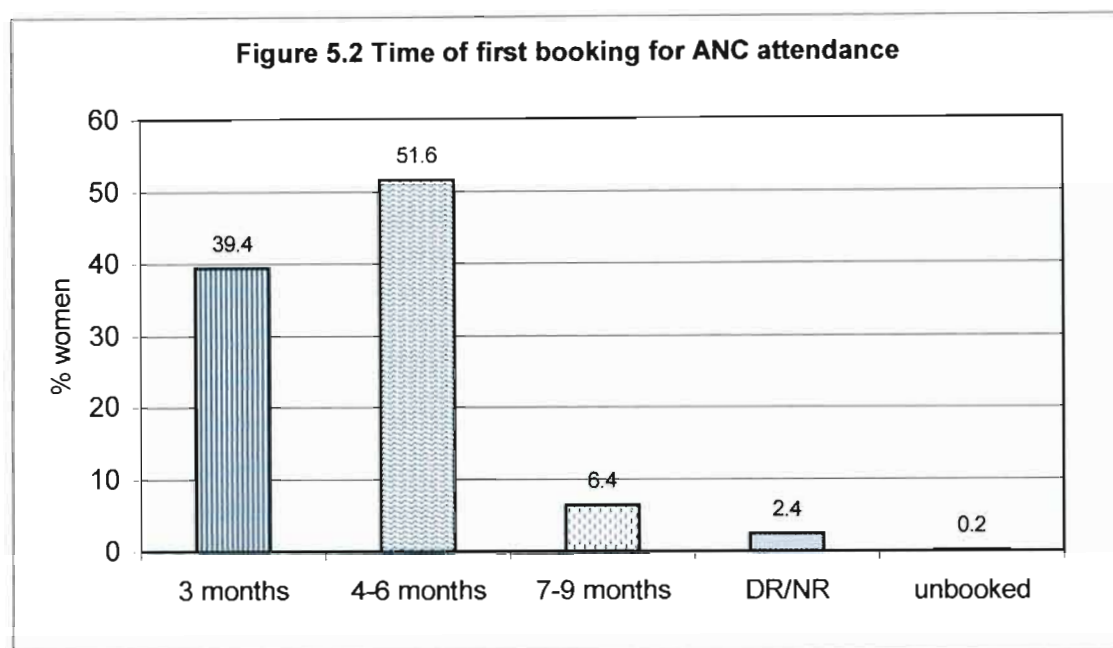
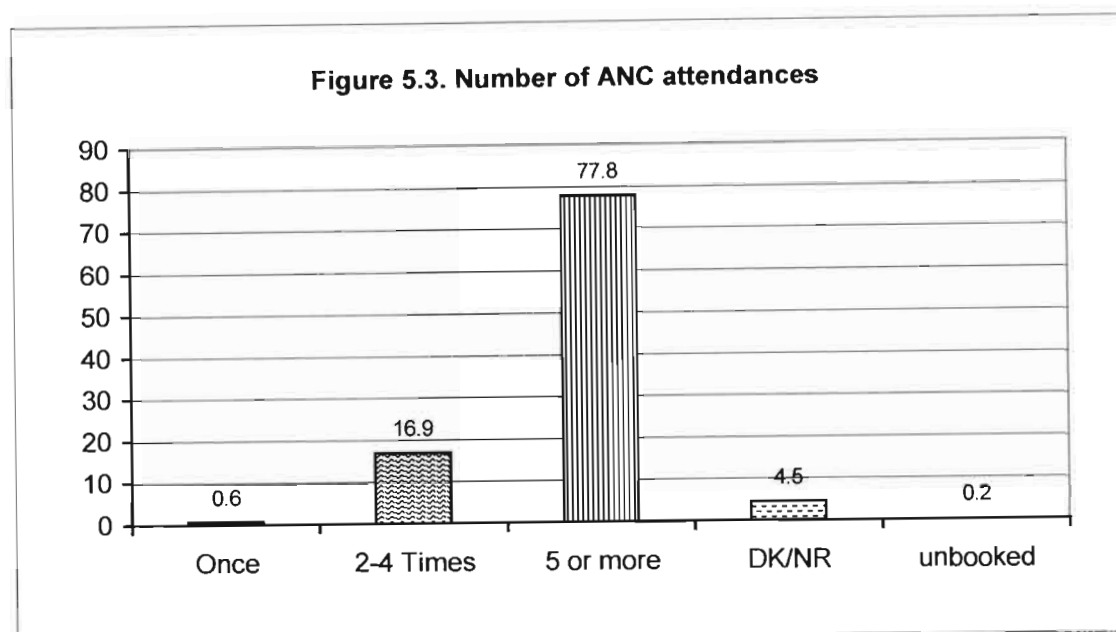


Figure 5.3 shows the number of ANC attendances. Of these 78% of women attended ANC more frequently making 5/more visits. Few women attended 2-4 times. The DR/NR shown in both Figures 5.2 and 5.3 represent the percentage of women who had attended ANC but could not remember when they attended ANC for the first time and the number of times they have attended ANC respectively. The results show that ANC attendance rates exceed the Department of Health target of 70% set for the year 1998 and are almost reaching the target of 100% for the year 2000 for South Africa. The important fact about these findings is that almost 100% of women attend ANC in this area that 82.8% receive this care at fixed clinics, and almost 95% of women attend ANC on at least two occasions or more. This is vastly better than patterns reported in many other developing countries (UNICEF, 2002).



### 5.5.2 Deliveries

The patterns of health service utilization for deliveries are quite different to those for ANC attendance at clinics. The first observation, again similar to those made previously in South Africa is that the majority of women (60.3%) delivered in hospitals (Table 5.8) (DNHPD, 1991; Ferrinho *et al.*, 1991; Uyirwoth *et al.*, 1996). Therefore these women had the benefit of being supervised by a trained health professional. The much larger reliance on hospitals than clinics for deliveries may reflect health service policies, patient preference or the suspension of 24-hour services in many rural clinics during the past 5-10 years.

The proportion of supervised deliveries that occurred at the health facilities in the study sample is consistent with that reported for rural areas of South Africa (SADHS, 1998). In general this proportion has reached the target for South Africa set for the year 2000 i.e. 70%. Although an explanation for home deliveries (22.8%) was not specifically sought, experience elsewhere has shown that most women intend to deliver at health facilities but cannot find transport when they go into labour at home (Buchmann *et al.*, 1989; Hamilton *et al.*, 1987; Solleder, 1987; O'Mahony &

Steinberg, 1995; Uyirwoth *et al.*, 1996). The number of home deliveries is better than patterns reported previously of 40-60% in the study area (Buchmann *et al.*, 1989), 60% in rural Freestate province (Cronje *et al.*, 1995) and 66% in Bizana district, Eastern Cape province (O'Mahony & Steinberg, 1995).

**Table 5.8 Place of delivery of the baby**

Facility	No	%
Clinic	105	16.9
Hospital	375	60.3
Home	142	22.8
<b>Total</b>	<b>622</b>	<b>100</b>

### **5.5.3 Family planning**

Despite the fact that 88% of the women reported being sexually active at the time of the survey, only 46.1% of the women were currently practicing family planning. More than 80% of those utilising this service, received it from fixed clinics. The main reasons given for not practising family planning were personal factors as opposed to those related to physical accessibility of health services. Common reasons given included spousal refusal (21.8%), her current state of health (20%), fear of side effects, absence of a current partner or boyfriend or the fact that she was pregnant, breastfeeding or not sexually active at the of the survey (Table 5.9).

Despite the restructuring of the health system, family planning service utilization remains low. This is very worrying given the benefits of utilising this service, particularly in relation to early detection and treatment of sexually transmitted diseases (Wilkinson *et al.*, 1997b) and in the light of the increasing prevalence of HIV/AIDS in South Africa.

There is obviously an urgent need to promote not only condom usage, but also family planning practice in general. These efforts are essential to make family planning more acceptable to rural communities, especially among men.

**Table 5.9 Reasons for not using family planning service**

Description	No	%
Husbands objects	73	21.8
Health reasons	67	20.0
Fear of side effects	51	15.2
No partner	30	9.0
Pregnant	18	5.4
Want more children	17	5.1
Breastfeeding	9	1.2
Religious reasons	4	2.7
Other	66	19.6
<b>Total</b>	<b>335</b>	<b>100</b>

## 5.6 Child health service utilization patterns

For the purpose of this study the main indicators of attendance at clinic and child health service utilization were the possession by the mother or caregiver of a RTHC, individual vaccination for the main vaccine-preventable diseases routinely provided for children in South Africa and attendance for growth monitoring and treatment of minor ailments. Although these services should be available in all health care settings in South Africa, these indicators predominantly reflect activities conducted at fixed and mobile PHC clinics, particularly in rural areas.

### 5.6.1 Possession of RTHC and vaccination coverage

As has been the case in numerous previous vaccination coverage surveys of children aged 0-5 years, the possession of RTHC (94.9%) in children between the ages of 12-23 months is very high (Coetzee *et al.*, 1993; SAVACG, 1995; Dammann & Solarsh, 1992; de Swardt *et al.*, 1990). As with ANC attendance and family planning service utilization, the majority of respondents preferred to use fixed clinics for vaccination services (80.9%). There was negligible utilization of hospitals for these services. A much smaller percentage of children (5%) go out of the district for these services than was the case for women seeking ANC or delivery of their babies (Table 5.10).

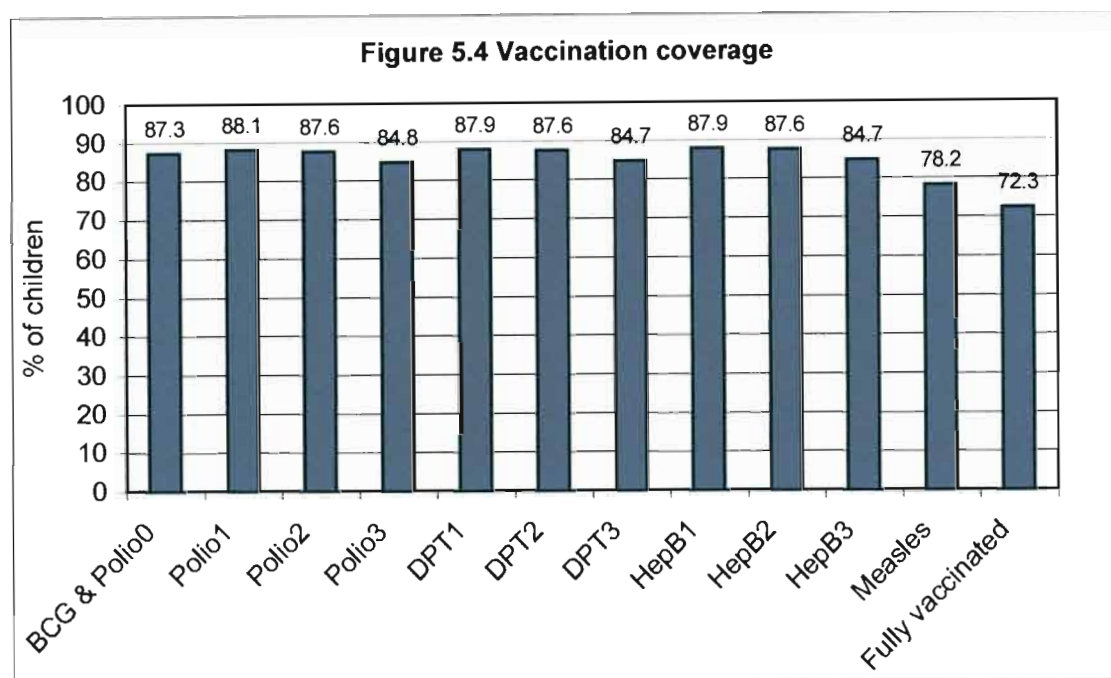
**Table 5.10 Child health service utilization indicators**

Indicator	No	%
Possession of RTHC	613	94.9
Vaccination from fixed clinic	499	80.9
Vaccination from mobile clinic	69	11.2
Vaccination from hospital	15	2.4
Vaccination from outside district	31	5.0
Not taken	3	0.5

Figure 5.4 shows vaccination coverage for the individual antigens across the entire sample obtained from the RTHC. Vaccination coverage levels achieved were 87.3% for BCG and Polio0, 88.1% for Polio1, 87.6% for Polio2, 84.8% for Polio3 and 78.2% for measles. A similar pattern of vaccination coverage was obtained for the corresponding vaccines for DPT and HepB. Comparisons of the individual vaccinations show minor differences between Polio, DPT, and HepB at the scheduled vaccination times. These differences are not significant and reflect the occasional, missed dose for one or other of these antigen doses. In general, there is a very small drop-out effect from BCG through Polio1, 2 and 3 with greatest drop-out effect between Polio3 and measles.



This reflects reasonable attendance at clinics up to and including nine months of age with relatively small drop out between 14 weeks and nine months.



The fully vaccinated group comprises those children who have received the full course of BCG, three doses of vaccines against polio; DPT; HepB and one dose of measles vaccine. This specifically excludes the second dose of measles and the booster doses of Polio and DPT (Polio4 and DPT4). Vaccination coverage for the fully vaccinated children was 72.3% in this sample. Although the coverage for the fully vaccinated children is still less than the South African target of 90% for both the years 1998 and 2000, the coverage of the study sample is better than the 49.5% reported for KwaZulu-Natal and 63.4% for South Africa (SADHS, 1998).

### **5.6.2 Clinic attendance for growth monitoring and for treatment of minor ailments**

Table 5.11 shows clinic attendance for growth monitoring and for treatment of minor ailments during the first year of life of the children. Overall 88.5% of children had visited the clinic for growth monitoring during this period.



The majority of these children (74.6%) utilised this service more frequently making 5-10 visits. Very few children did not attend the clinic for growth monitoring (11.5%). Whereas all children are expected to attend for vaccination in order to prevent vaccine-preventable diseases, attendance rates for minor ailments are in response to illness and will vary from one child to another. It is likely that health-seeking behaviour will be different for preventive and curative services.

It is also quite difficult to interpret attendance rates for minor ailments, as the rate will depend on the burden of illness in that community. It is therefore not reasonable to expect that 100% of children will or should attend for these services. This makes vaccination coverage a better index of child service utilization at clinics than attendance for minor ailments. Six hundred and fifteen children (95.2%) were taken to a clinic during the first year of life for treatment of minor ailments other than for routine vaccinations or growth monitoring. Of these children 43% made frequent visits of five or more.

**Table 5.11 Clinic attendance for growth monitoring and for treatment of minor ailments**

Description	No	%
All visits	572	88.5
No visits	74	11.5
< 5 visits	106	18.5
5-10 visits	427	74.6
> 10 visits	39	6.9
Clinic attendance for treatment of minor ailments	615	95.2

## **5.7 Health status**

Health status is considered to be at least partly linked to health service utilization in that health status is an outcome of both health service accessibility and utilization, even though the relationship is a complex one. Therefore it is assumed that health service utilization will result in improved health status. Due to time and financial constraints, other indicators of health status such as infant mortality, maternal and perinatal mortality rates, and prevalence of vaccine-preventable diseases could not be explored. Child health status indicators were measured by using child's birthweight, current anthropometric status and prevalence of minor ailments (Table 5.12).

### **5.7.1 Birth weight and nutritional status**

The accepted cut off point for LBW is 2.5 kg. Children weighing less than this, are considered to be at higher risk for neonatal mortality and for morbidity and disability in infancy and early childhood. LBW is an outcome of poor social and environmental conditions, poor maternal nutrition and maternal health status during pregnancy (UNICEF & NCRC, 1993). There is a surprisingly low proportion of children with weights under 2.5 kg (6%).

A possible explanation for this is that most homestead members are engaged in subsistence farming that includes crops such as groundnuts, vegetables, fruit and sugarcane. The other possible reason is that this may be a measurement artefact since LBW infants have much higher neonatal and infant mortality rate than normally grown infants, almost 10 times and four times respectively, (Ashworth, 1998) and as a result a significant proportion of these LBW infants may have died by the time their cohort entered the survey period of children aged 12-23 months.

The anthropometric patterns from this survey are consistent with those recorded in black rural pre-school children over the last 10-15 years (SAVACG, 1995, Solarsh *et al.*, 1994, Ramphela *et al.*, 1991; Raynal, 1983). Wasting, measured as weight-for-height deficits of  $<-2$  SD, was recorded at 1.2%, stunting measured as length-for-age deficits of  $<-2$  SD, was recorded at 25.9% and underweight, measured as height-for-age deficit of  $<-2$  SD, was recorded at 6.2% (Table 5.12). This confirms that chronic undernutrition is the predominant problem in the study area.

**Table 5.12 Child health status indicators**

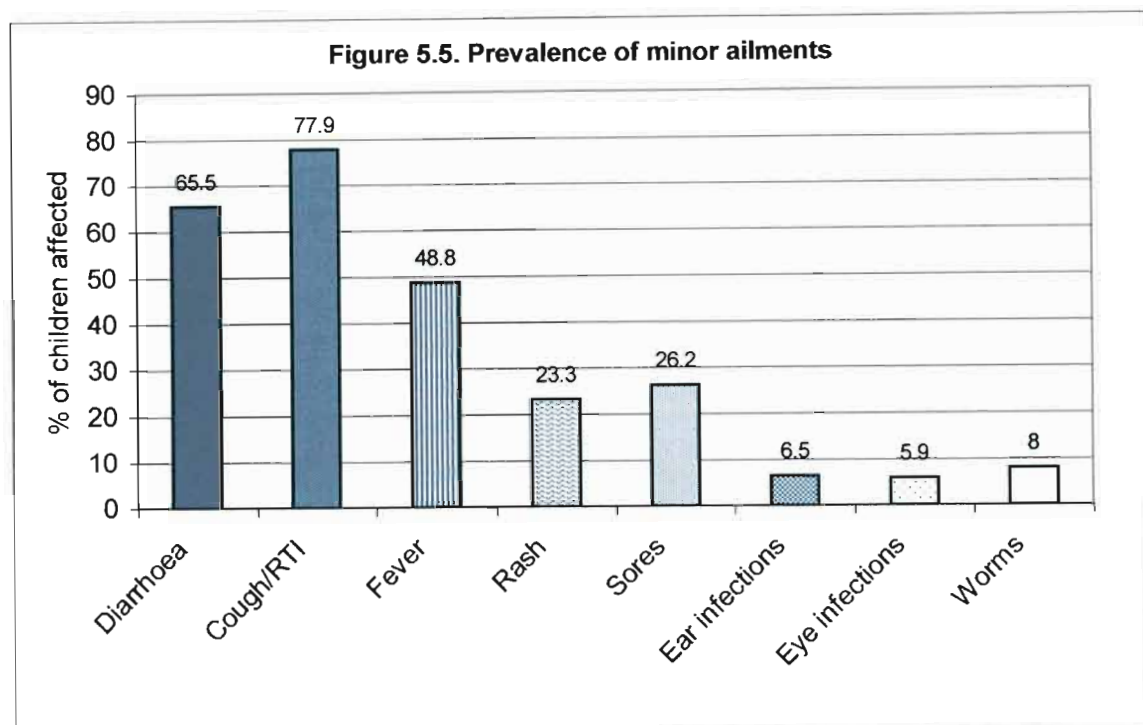
Indicator	No	%
LBW ( $< 2.5$ kg)	31	6
Wasting	8	1.2
Stunted	167	25.9
Underweight	40	6.2

### **5.7.2 Prevalence of minor ailments**

A wide range of symptoms or conditions was recorded on the RTHC of children in this study. Each child had visited the clinic more than once and for different illnesses. The percentages shown in Figure 5.5 reflect the total number of children suffering from a particular illness out of the 615 children who visited the clinic during the first year of life. Each ailment was calculated separately as each child had more than one ailment.

The observation is that respiratory tract infections (RTI) including cough, asthma, pneumonia etc. seemed to be the most prevalent (77.9%), followed by diarrhoea and fever. Although fever and cough are non-specific symptoms and could therefore be present in more than one illness or health condition, they are recorded here as separate minor ailments. Other common ailments reported were rash, sores, that affect any part of the body, including scabies, veld sores and impetigo, and worm

infestations (Figure 5.5). The recorded prevalence of worm infestations could be an under estimate since the children were not screened. Previous studies have recorded prevalence of worm infestations above 70% (Appleton *et al*, 1999, Knight, 1998; Schutte *et al.*, 1981a).



## 5.8 MCH-related knowledge and practices

Since health education is an essential part of the package of services offered at PHC clinics, health knowledge and key health practices are expected to improve through regular contact with these services. The level of health knowledge and practices were determined through the assessment of the number of children who were breastfed, knowledge of the benefits of breastfeeding, knowledge of how to prepare and mix breastmilk substitutes correctly and hygienically, the number of respondents who were able to explain the child's growth chart and who knew how to control diarrhoea using home-made oral rehydration therapy (ORT) or home preparations.

time during their first two years of life. As has been found in many other surveys, the majority of women (57.2%) had used breastmilk substitutes at some point or another in infancy usually between two and five months of age (Hirschowitz *et al.*, 1995; SADHS, 1998; Solarsh *et al.*, 1994). Table 5.13 shows survey findings about MCH-related knowledge and practices. Most women claimed to have received an explanation of the benefits of breastfeeding from the health worker and when asked to explain the benefits of breastfeeding, 76.6% of women could do so.

Over half of the respondents mentioned that they could correctly mix formula feeds and the majority of respondents (68.3%) knew how to prepare formula feeds hygienically (Table 5.13). Approximately 50% of respondents claimed to have had an explanation from the health worker about growth monitoring. However, a few could explain the meaning of the child's growth chart when asked to do so. This suggests that feeding practices were suboptimal in a substantial number of cases.

**Table 5.13 MCH-related knowledge and practices**

Indicator	No	%
Explanation of breastfeeding benefits by health worker	523	81.1
Explanation of breastfeeding benefits by respondent	494	76.6
Correct mixing of bottle feeds	329	50.9
Hygienic preparation of bottle feeds	441	68.3
Explanation of growth monitoring by health worker	296	45.8
Explanation of growth monitoring by respondent	271	42.0

Table 5.14 shows findings from the MCH survey about knowledge of how to control diarrhoea using ORT. The majority of the respondents (67.5%) said that they could mix a packet of ORS correctly. A similar response was obtained from those respondents who could mix sugar salt solution (SSS) from home ingredients. While most respondents said that home-mixing requirements for SSS were available in their

homes at the time of the survey (66.9%), a packet of ORS was available to few homes. Positive responses regarding the duration of using SSS after mixing and the amount of ORS to give to a child with diarrhoea were low (41.5% and 51.1% respectively). A majority of women knew the duration of administration of ORS to a child with diarrhoea. Similarly, correct responses were obtained regarding breastfeeding during diarrhoea (Table 5.14).

**Table 5.14 Knowledge about control of diarrhoea using home preparations**

Knowledge indicator	No	%
Mixing ORS correctly	436	67.5
Mixing SSS	448	69.3
Availability of SSS for home-mixing	432	66.9
Availability of ORS for home-mixing	68	10.5
Duration of using SSS after mixing	268	41.5
Amount of ORS/SSS to be given to child	330	51.1
Duration of ORS administration	583	90.2
Breastfeeding during diarrhoea	524	81.1

Key      SSS = sugar, salt solution  
             ORS = oral rehydration solution

## 5.9 Discussion

The hypothesis in this thesis is that increasing absolute distances between homesteads and fixed clinics in rural areas are associated with underutilization of health services by residents of those homesteads, and as a consequence of this, with poor health status amongst homestead members. This hypothesis is built on a number of assumptions about health services in South Africa. These are that there are many homesteads that are still substantial distances from PHC clinics; that impoverished rural populations gain access to those facilities by walking and that significant numbers of homesteads are at greater distances from clinics than can reasonably be

expected to be covered on foot. An additional assumption is that most people in a poor rural community will choose to use their nearest PHC clinic. Further implied assumptions are that these populations continue to carry a very heavy burden of disease and that these diseases are amenable to the interventions that are offered by health service providers at these fixed PHC clinics. If all these assumptions are correct there would be every reason to believe that the provision of good quality PHC services at clinics within easy walking distance would improve utilization of these services and would result in improvements in health status for client populations.

In this chapter the researcher examines some of these underlying hypotheses about populations and health services in South Africa before specifically analysing whether increasing distance from health services does in fact predict MCH service utilization and MCH status in the study area. For reasons already provided, the researcher has chosen to study this relationship with special reference to services for and health status of mothers and their young children.

An assessment of the characteristics of the study subjects revealed that the living conditions in the study area are characterized by a high proportion of school non-attendance, lack of a regular source of income, poor housing and poor water quality. Therefore the socio-economic status based on these indicators, was considered to be suboptimal in approximately 70% of sampled homesteads. Despite the new dispensation in the South African government, these conditions have remained the same for more than a decade (Derman & Poultney, 1989; Vandeverre Apsey Robinson & Associates, 1989; Statistics South Africa 1991; 1996; 2000; the Education Foundation, 2000).



A preliminary analysis of catchment areas around fixed PHC clinics in the study area confirms that significant proportions of the population obtain their health care from clinics that are greater than 5 km and in some cases, up to 16 km from their places of residence. This suggests that the research question is relevant for the study population and presumably for other geographically dispersed populations elsewhere in South Africa.

A survey of homesteads in this area suggests that over 50% of the population are not restricted to pedestrian travel and that many utilise public transport in order to access health services. Although they may still choose to use the nearest facility the fact that people are using transport does make it possible for them to be more selective about the health services that they use and to move beyond the nearest clinic for their health care.

In a health system in which fixed PHC clinics may not be the only option for first contact and preventive health care, there may be other factors confounding the relationship between distance and clinic utilization. CHWs, who may potentially answer needs for health care and alter normal health-seeking behaviour, are an established part of the health service in the study area. Although 80% of the homesteads in the study area were visited by CHWs, only 34% were visited on a monthly basis as directed and many visit much less frequently. Also, since the main role of CHWs is to offer health promotion, their activities should not decrease the need for certain preventive and curative services that can only be offered by health facilities. It seems unlikely that the presence of CHWs will significantly confound the effect of distance on health services utilization in this study, but this will be specifically examined in the analysis of the effect of accessibility and MCH service utilization and MCH status in Chapter 6.



Other factors that might modify the effect of distance on MCH service utilization and MCH status are maternal characteristics such as age and levels of education, which are known to be associated with higher risks for infant mortality and morbidity (SADHS, 1998). Although the average maternal age in the survey sample was 28 years, 15% of women were between 15 and 20 years of age and more than 60% of mothers were functionally illiterate. The analysis of the effect of distance on MCH service utilization and MCH status in Chapter 6 was adjusted to account for these variables.

Parity and gravidity, terms that reflect the number of live births and the number of pregnancies respectively, together provide a measure of pregnancy outcome and specifically, of foetal losses. The findings in this survey suggest relatively few miscarriages or stillbirths in this population. Parity and gravidity also provide a very rough indication of fertility of the population and it is interesting to note that 43% of mothers in this sample had had four or more pregnancies. In contrast the average birth interval was greater than two years for over 90% of women reflecting successful family planning. These variables, while interesting, have little direct bearing on the primary research question. However, parity was used to adjust for the effect of distance on MCH service utilization and MCH status discussed in Chapter 6.

Of more direct relevance to the main research question was an assessment of MCH service utilization patterns and MCH status based on selected indicators for both mothers and children. These showed very high rates for ANC attendance (almost 100%) with the majority of visits (83%) occurring at clinics rather than at hospitals and a surprising 95% of women having two or more ANC visits during their pregnancies. This shows an exceedingly high utilization of ANC services and leaves little room for decreasing distance to have a significant additional effect on ANC attendance.

Although 80% of women deliver their babies at health facilities under medical supervision, over 60% of these deliveries occur in hospital rather than in clinics. Distance from hospital has been shown elsewhere to be a major contributing cause to the 20% of deliveries that occur at home (O'Mahony & Steinberg, 1995; Thaddeus & Maine, 1994). For this reason, the analysis on the effect of distance on MCH service utilization will be examined for distance from both the hospital and the clinic in relation to deliveries. However, since health services utilization at clinics rather than hospitals is the main issue of interest in this study, this will not be investigated any further.

There are relatively low rates of contraception uptake in mothers sampled in this survey and the majority who made use of family planning methods, selected injectable contraceptives, which offer no protection against HIV infection. Since the majority of women obtained their contraception at fixed clinics, this issue was further explored in attempting to establish a relationship between distance and MCH service utilization and MCH status.

The vast majority of children aged 12-23 months were found to possess RTHCs and there were relatively high levels of vaccination coverage for all antigens with only a small drop out between the third dose of Polio/DPT/HepB at 14 weeks and measles at 9 months of age. Not surprisingly given the high attendance for vaccination at fixed clinics, there was also a high attendance rate for growth monitoring at these clinics. Here as for ANC attendance, there was a relatively little room to show a distance effect as vaccination coverage was already so high.

Low rates of LBW (6%) are probably a measurement artefact in that LBW infants have high neonatal and infant mortality rates and will not therefore be counted in a survey of children aged 12-23 months. There will be scope to look at the effect of distance on anthropometrical status, which shows frequency distributions similar to those seen in

South African Populations for the past 15 years (Raynal, 1983; Ramphele *et al.*, 1991; SAVACG, 1995; Solarsh *et al.*, 1994), namely high rates of stunting and relatively low rates of wasting.

Initiation of breastfeeding occurred in 97% of infants and breast milk substitutes were introduced in almost 60% of infants in early infancy. A relatively large number of mothers were also able to correctly describe how formula should be reconstituted. Since these key health practices are presumable a function of proximity to clinics and the exposure to health education messages or lack thereof, these also should be influenced by distance. Therefore the analysis of the effect of distance on MCH service utilization and MCH status discussed in chapter 6 will include these key health practices.

Having presented the study subjects, their characteristics, the indicators of MCH service utilization and MCH status and the possible variables that might confound the relationship between distance and MCH service utilization and MCH status in chapter 5, chapter 6 examines the effect of distance on MCH service utilization and MCH status and the effect of other factors of accessibility mentioned above on MCH service utilization and MCH status.

## **CHAPTER 6**

### **RESULTS AND DISCUSSION 2**

#### **6.1 Introduction**

Chapter 5 provided descriptions of the study subjects, their characteristics and MCH service utilization patterns and MCH status as a background to the analysis of accessibility and its relationship to MCH service utilization and status that are presented in chapter 6. This chapter begins with a discussion of accessibility measured from the comparison and delineation of catchment areas for PHC clinics based on distance and usage for the entire study area. In this analysis, catchment population for individual PHC clinics are compared with each other and with the study area as a whole by distance. This comparison includes the calculation of the population using their nearest clinic.

The chapter goes on to discuss accessibility in terms of minimum, maximum and mean absolute distances of homesteads from PHC clinics that homesteads members travelled before and after the CUBP. This analysis provided an important description of the distribution of individual homesteads in relation to PHC clinics that their members claimed to use. This also provides a preliminary assessment of the efficiency of this extensive CUBP as part of the transformation of the health system. The concluding sections of chapter 6 discuss accessibility measured using distance buffers around PHC clinics. This accessibility is examined in relation to MCH service utilization patterns and MCH status presented in chapter 5. Distance effects are examined for each of the indicators of MCH service utilization patterns and MCH status. Since it has been shown elsewhere that absolute distance is not the only determinant of health service utilization

and health status, one section explores the effect of other factors of accessibility that may confound distance effects for MCH service utilization patterns and MCH status. The effect of these factors as independent variables is also examined. These factors include maternal age, parity, maternal education, mode of transport, CHW visits and child's sex.

## **6.2 Accessibility measured from catchment areas for PHC clinics**

The purpose of the comparison and delineation of catchments areas for PHC clinics was to determine whether distance provides a reasonable proxy for clinic usage i.e. if the analysis showed a very close overlap between populations in the catchment areas based on distance and usage for the same clinic, it would suggest that distance is a valid construct for the planning of services for a given population. This exercise was the first and the most macro level at which the relationship between distance and service utilization was addressed.

Table 6.1 shows a comparison of catchment population of individual PHC clinics with each other and with the study area as a whole in the catchment areas of 14 PHC clinics based on distance (five of the 19 PHC clinics were excluded because they had missing population data). The comparison is based on the percentage of population located at 0-5, 6-10 and >10 km within each catchment area of the nearest clinic. The 14 clinics included the five clinics (Madonela, Makhathini, Mbazwana, Ntshongwe and Ophansi) that will be analysed in greater detail later when the relationship between distance and MCH service utilization and MCH status is examined. The results reveal two patterns of distribution of catchment population in relation to the nearest clinic.

**Table 6.1 Distribution of population within catchment areas for PHC clinics based on distance**

Clinics	0-5 km		6-10 km		>10 km		Total
	No	%	No	%	No	%	
Kwandaba	7217	63.2	4112	36.0	83	0.7	11412
Madonela	5170	54.9	3711	39.4	528	5.6	9409
Makhathini	3900	38.3	6232	61.3	42	0.4	10174
Mahlungulu	4424	78.8	1166	20.8	23	0.4	5613
Mbazwana	4969	49.4	4084	40.6	1003	10.0	10056
Mduku	7360	70.8	784	7.5	2258	21.7	10402
Mnqobokazi	5909	86.6	659	9.7	255	3.7	6823
Ndumu	5015	36.0	7082	50.8	1849	13.3	13946
Nibela	6085	73.4	1967	23.7	243	2.9	8295
Ntshongwe	2044	45.4	1702	37.8	753	16.7	4499
Ophansi	4102	41.0	5328	53.2	586	5.9	10016
Phelandaba	2679	25.1	4697	44.0	3287	30.8	10663
Shemula	3893	43.4	4256	47.4	824	9.2	8973
Zamazama	4945	90.9	494	9.1	0	0.0	5439
<b>TOTAL</b>	<b>67712</b>	<b>53.9</b>	<b>46274</b>	<b>36.8</b>	<b>11734</b>	<b>9.3</b>	<b>125720</b>

The first pattern is characterized by a decrease from 0-5 km to 6-10 km to >10 km. Nine clinics exhibited this pattern namely, Kwandaba, Madonela, Mahlungulu, Mbazwana, Mnqobokazi, Mduku, Nibela, Ntshongwe and Zamazama. Seven of these clinics had 60-91% of their catchment population located within the 0-5 km leaving less than 40% of the population in the 6-10 km and 0-10% in the >10 km. This pattern is similar to that of the entire study area with 53.9% of the catchment population located in the 0-5 km, 36.8% in the 6-10 km and 9.3% in the >10 km. In the second pattern the majority of the catchment population was distributed within the 6-10 km than in the 0-5 km and the > 10 km. The clinics that exhibited this pattern were Makhathini, Ndumu, Ophansi, Phelandaba and Shemula Clinics. These clinics had less than 40% of their catchment population distributed within 0-5 km, 44-61% concentrated in the 6-10 km and 0-10% of the remaining population located at distances beyond 10 km.

Table 6.2 shows the percentage of catchment population that preferentially used their nearest clinic. The results show patterns of clinic utilization by distance from the clinic. With the exception of Mngobokazi Clinic, which is located near the Lebombo Mountains (46.6%), the majority of the catchment population (80%) of the other 13 clinics were utilising their nearest clinic. The low utilization of Mngobokazi clinic could be attributed to the fact that the road leading to this clinic is highly dependent on weather conditions making the clinic difficult to access at times.

One of the limitations of using Thiessen polygons to measure accessibility is that this method assumes absolute distance. This ignores natural barriers like mountains and rivers, which will reduce accessibility. Utilization of the other 13 clinics ranged from 62.9% in Kwandaba to 99.6% in Zamazama. These clinics includes the five selected clinics of Madonela, Makhathini, Mbazwana, Ntshongwe and Ophansi which formed the basis for a more detailed analysis of the effect of accessibility on MCH service utilization and MCH status later in this chapter.

These five clinics had a relatively high percentage of utilization by population in their catchment areas (91%) compared to the other nine clinics (74.6%). The five clinics also had little interference by mobile clinics or hospitals. Therefore they offered good examples to examine in terms of the research question. Two overlapping explanations for the high percentage of population using the nearest clinics can be offered. Either people lacked the means to travel long distances and were therefore reliant on their nearest health facility, irrespective of their preferences, or they perceived that all the clinics offered a similar range and standard of PHC services and there was, therefore, nothing to be gained by travelling further for these services. The first explanation gains some support from the results presented in section 6.3



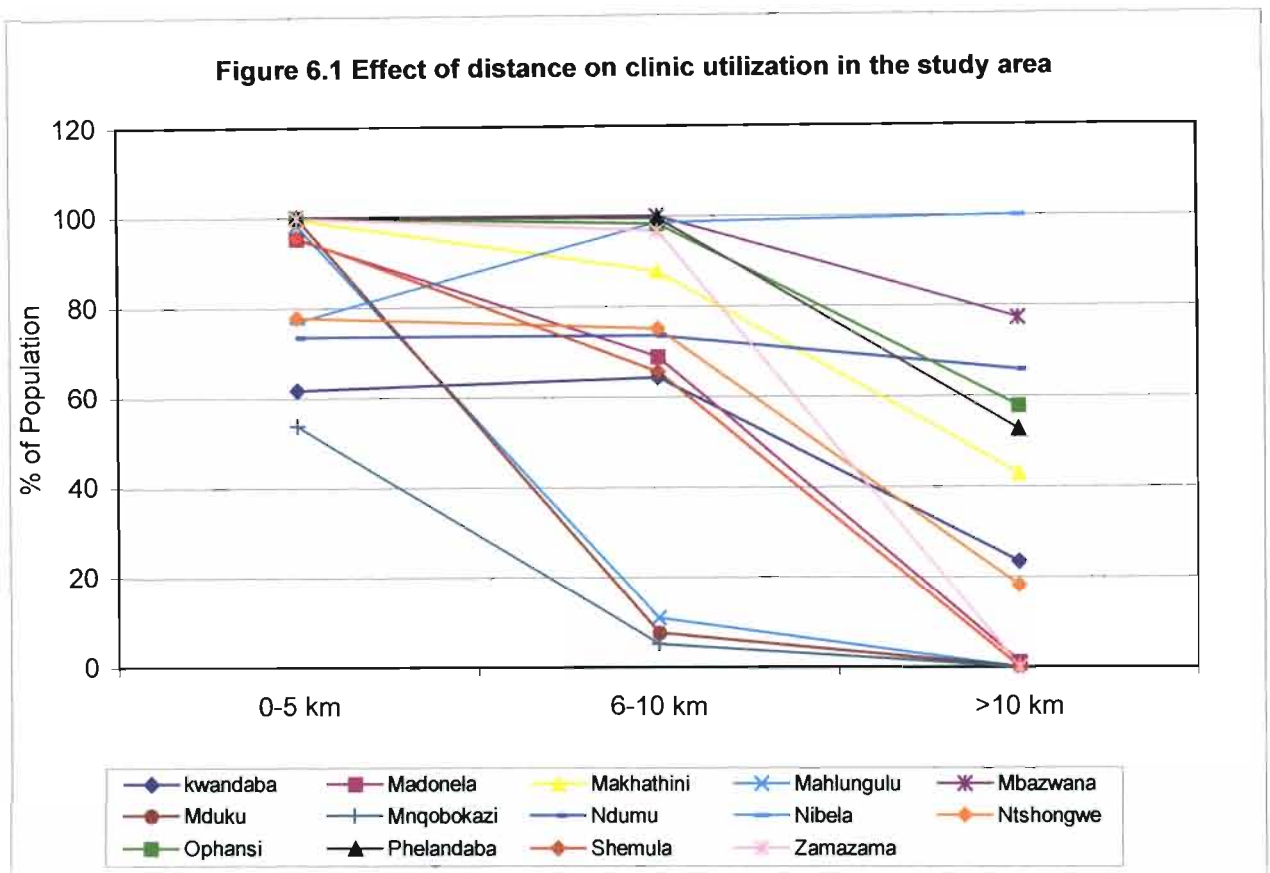
**Table 6.2 Proportion of the catchment population utilizing the nearest clinic**

Clinics	0-5 km		6-10 km		>10 km		Total	
	No	%	No	%	No	%	No	%
Kwandaba	4449	61.6	2644	64.3	89	23.5	7182	62.9
Madonela	4920	95.2	2555	68.8	6	1.1	8562	91.0
Makhathini	3886	99.6	5462	87.6	18	42.9	9348	91.9
Mahlungulu	4343	98.2	128	11.0	0	0.0	4471	79.7
Mbazwana	4969	100.0	4084	100.0	774	77.2	9803	97.5
Mduku	7360	100.0	60	7.7	0	0.0	7420	71.6
Mnqobokazi	3177	53.8	34	5.2	0	0.0	3177	46.6
Ndumu	3681	73.4	5200	73.4	1216	65.8	10097	72.4
Nibela	4680	76.9	1937	98.5	243	100.0	6860	82.7
Ntshongwe	1590	77.8	1279	75.1	137	18.2	3006	66.8
Ophansi	4102	100.0	5232	98.2	338	57.7	9672	96.6
Phelandaba	2679	100.0	4673	99.5	1730	52.6	9082	85.2
Shemula	3719	95.5	2789	65.5	0	0.0	6508	72.5
Zamazama	4941	99.9	477	96.6	0	0	5418	99.6
<b>TOTAL</b>	<b>58496</b>	<b>86.4</b>	<b>36554</b>	<b>79.0</b>	<b>4551</b>	<b>37.8</b>	<b>100606</b>	<b>80.0</b>

### 6.3 Effect of absolute distance from clinics on clinic utilization

The data presented in this section provide an overview of clinic utilization patterns at 0-5 km, 6-10 km and >10 km for the entire study area (Table 6.2 and Figure. 6.1). The results show very high average clinic utilization by catchment population within a distance of 5 km from those clinics (86.4%) and this was a consistent finding for 13 of the 14 clinics assessed in the study area. As distance increased beyond 5 km, average clinic utilization fell across the study area (79.0%) though this fall-off in clinic utilization was much more striking for some clinics than for others. The catchment population in nine of the 14 clinics (Kwandaba, Makhathini, Mbazwana, Ndumu, Nibela, Ntshongwe, Ophansi, Phelandaba and Zamazama) continued to use its nearest clinic up to a distance of 10 km. Eight of these nine clinics had over 70% of their catchment population using their nearest clinic up to the 10 km cut-off.





Beyond 10 km the fall-off in clinic utilization was consistent for all the clinics with an average utilization of 37.8%. The results agree with the findings from previous studies conducted in the developing countries and those from Hlabisa district (Freeman *et al.*, 1983; Muller *et al.*, 1998; Rahaman *et al.*, 1982; Schellenberg, 1998; Thaddeus & Maine, 1994; Tanser *et al.*, 2001). From Table 6.1 above it is shown that for the 14 clinics, 53.9% of the catchments population was located within 5 km, 36.8% within 6-10 km and 9.3% located beyond 10 km. The results on clinic utilization also show that there are two categories of clinics in the study area i.e. those clinics that achieved a high utilization by their natural catchment populations up to 10 km (9 clinics referred to above) and those that only achieved a high utilization up to 5 km (Madonela, Mahlungulu, Mngobokazi, Mduku and Shemula).

It is not clear why these differences exist. This is an interesting finding that suggests that distance cut offs of 10 km may well be adequate for some clinics but more investigation is needed before any conclusions can be made regarding this cut-off distance. The fact that four of five selected clinics of Makhathini, Mbazwana, Ntshongwe and Ophansi fall within the category of clinics with high utilization patterns up to 10 km has important implications for the analysis of the effect of distance on MCH service utilization and MCH status discussed in the following sections.

Although the findings presented in section 6.3 provides broad insights about patterns of service utilization, they reflect less on the patterns of service utilization for specific categories of services, such as MCH services. They also do not address the question of whether use or non-use of these services is necessarily associated with better or worse health status respectively. These issues, which are central to the purpose of this thesis, will be examined in some detail in later sections of this chapter. Before addressing these key issues and while still dealing with accessibility and coverage of PHC facilities for the study area as a whole, it is appropriate to briefly present data on the impact of the CUBP on PHC clinic coverage in the study area.

#### **6.4 Accessibility measured from minimum, maximum and mean distances before and after the CUBP**

Table 6.3 presents the minimum, maximum and mean absolute distances from clinics travelled by homestead members before and after the CUBP for the entire study area. As expected the minimum distances are the same for both periods. There are significantly greater differences in maximum distances between these periods resulting in a decrease of 41.2% after the CUBP. This suggests that before the CUBP, people endured greater travel distances to access PHC clinics.

The mean distance has decreased from 8.5 km (SD 5.5) before the CUBP to 5.3 km (SD 3.2) after the CUBP resulting in a decrease of 37.6% ( $p < 0.0001$ ). This clearly indicates that the CUBP has improved accessibility of PHC clinics by reducing absolute distances between homesteads and clinics.

**Table 6.3 Comparison of minimum, maximum and mean distances before and after the CUBP**

Period	Minimum	Maximum	Mean (SD)
Before CUBP	0	30.1	8.5 (5.5)
After CUBP	0	17.7	5.3 (3.2)

## **6.5 Effect of absolute distance on maternal health service utilization**

The previous section provided a macro level analysis of accessibility of PHC clinics measured from distances in the study area as a whole. The discussion in this section will focus on accessibility in relation to specific indicators of maternal health service utilization such as ANC attendance, delivery and family planning services. The accessibility discussed here was measured from 1 km distance buffers created around five PHC clinics referred to in section 6.2. and 6.3. (See also Chapter 4). These indicators were compared at 0-5 km, 6-10 km and >10 km. The differences in maternal health service utilization between these distance categories were considered to be statistically significant at  $p$  values less than 0.05.

### **6.5.1 Effect of absolute distance on ANC attendance**

Table 6.4 shows the effect of absolute distance on ANC attendance for those women who have attended at least once during their pregnancy, the frequency of attendance and the time of the first booking for ANC attendance.

There was no distance effect for ANC attendance for those women who have attended at least once during their previous pregnancy. For example, there were 99.6% of the women at 0-5 km, 100% at 6-10 km and 100% at distances beyond 10 km and these were not statistically significant. The results were similar for the number of ANC visits and the time for first booking for ANC attendance (Table 6.4).

**Table 6.4 Effect of distance on ANC attendance**

MCH indicator	0-5 km		6-10 km		> 10 km		Total		P-value
	No	%	No	%	No	%	No	%	
At least once	268	99.6	254	100	99	100	621	99.8	0.518
2-4 visits	40	16	43	17.6	22	23.2	105	17.8	0.297
5/More visits	210	84.0	202	82.4	73	76.8	485	82.2	
Booking at 3 Months	106	40.9	96	38.2	43	44.3	245	40.4	0.714
Booking at 4-6 Months	139	53.7	136	54.2	47	48.5	322	53.0	
Booking at 7-9 Months	14	5.4	19	7.6	7	7.2	40	6.6	

### **6.5.2 Effect of absolute distance on place of delivery and family planning**

In South Africa most deliveries occur at hospitals rather than at PHC clinics. Reasons for this include the lack of a 24 hour services at many clinics because of the inability to guarantee the security of staff and patients after dark in many rural districts; lack of skilled supervision for deliveries in some areas as a result of nursing staff shortages; and the perception by many patients that hospitals are the best and safest place to deliver their babies. As shown in Chapter 5 the majority of women (60%) in the study area delivered at hospitals and a significant number still delivered at home, probably as a result of the inability to reach hospitals after the onset of labour, which may well be related to distance from the hospital. For these reasons, it was considered important to examine distance effects both for clinics and for hospitals.

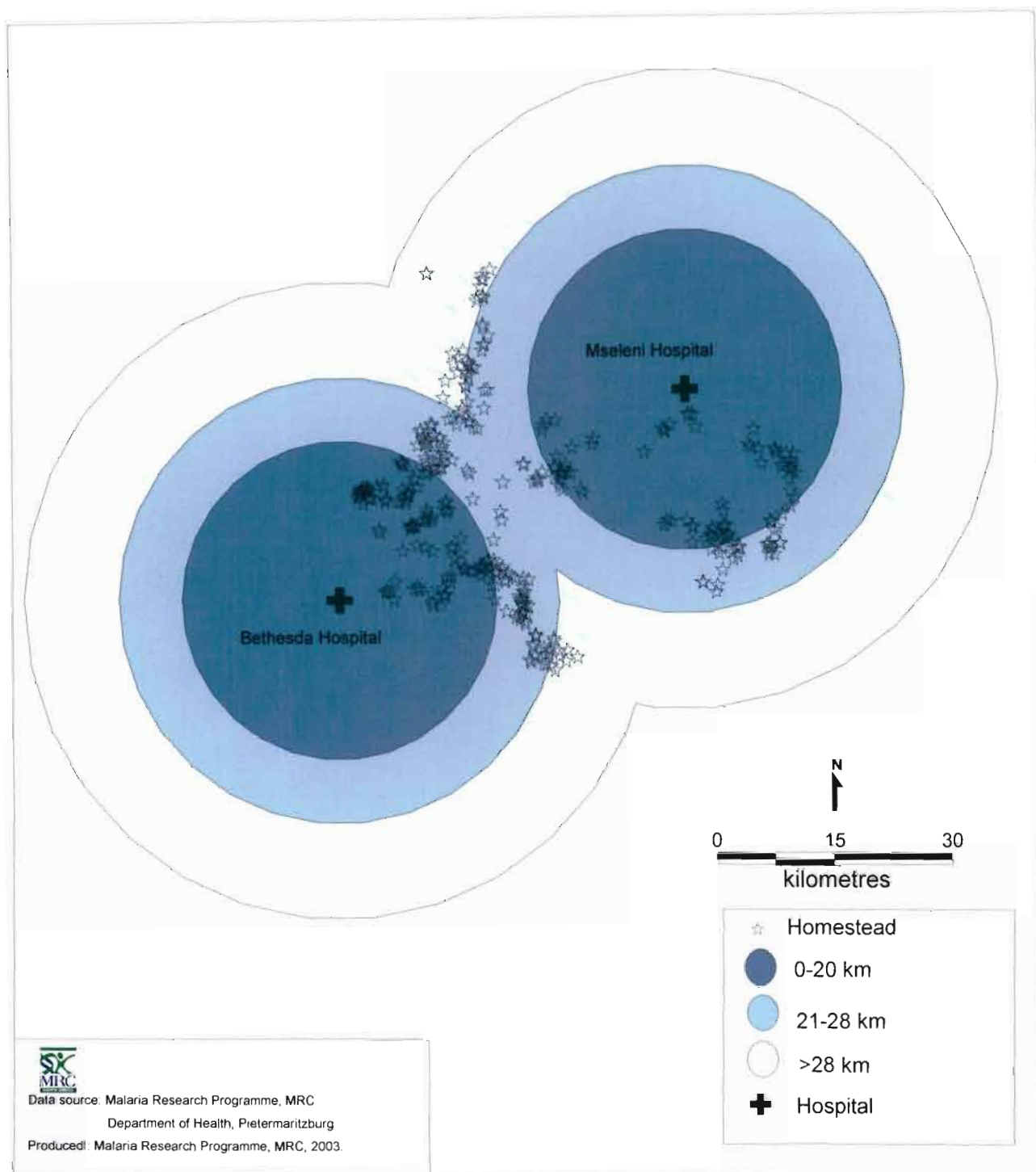
Table 6.5 provides results of the effect of distance on clinic delivery and current use of family planning services and Figure 6.2 shows results of the effect of distance on hospital delivery. The percentage of clinic deliveries decreased from 54.6% at a distance of 5 km to 32.7% at distances beyond 5 km ( $p < 0.0077$ ). Similarly, the percentage of hospital deliveries decreased from 77.8% at 0-20 km to 74.5% at 21-28 km and then dramatically to 57.7% at distances above 28 km ( $p < 0.0056$ ). A finding similar to that observed in Bizana district, Transkei, is that the number of home deliveries increased with increasing distance from the hospital (O'Mahony & Steinberg, 1995). Although there was distance effect for hospital delivery, this study is concerned with placement of clinics in rural areas.

**Table 6.5 Effect of distance on clinic delivery and current family planning use**

MCH Indicator	0-5 km		6-10 km		> 10 km		Total		P-value
	No	%	No	%	No	%	No	%	
Clinic delivery	53	54.6	33	32.7	19	44.5	105	43.6	0.0077
Home delivery	44	45.4	68	67.3	24	55.8	136	56.4	
Family planning	121	45.1	115	45.3	50	50.5	286	6.1	0.625

Even though steps can theoretically be taken to improve clinic services so that there is a greater likelihood that women might choose to have their deliveries at the clinics, many problems are related to quite deep structural problems in the South African health system. Therefore, it seems unlikely that providing clinics closer to homesteads will necessarily reduce the number of home deliveries unless 24-hour skilled delivery services can be offered at those clinics. The fact that there are no distance effects for utilization of family planning does not come as a surprise as it was seen in Chapter 5 that the reasons given for low utilization of family planning services were more personal than related to accessibility of PHC clinics.

**Figure 6.2 Effect of absolute distance on hospital delivery**



## **6.6. Effect of absolute distance on child health service utilization**

This section presents results on the effect of distance on child service utilization indicators such as availability of RTHC, vaccination coverage, growth monitoring, and attendance at the clinic for treatment of minor ailments. The analysis was carried out as for maternal health service utilization.

### **6.6.1 Effect of absolute distance on availability of RTHC and vaccination coverage**

One of the primary activities provided at fixed PHC clinics is a vaccination service for children. In the vast majority of cases these services are offered at clinics rather than at outpatient departments in rural community hospitals. Community-based surveys of vaccination coverage are therefore probably one of the best indicators of PHC clinic utilization in this study. Since RTHCs are used as the main record keeping system for childhood vaccinations they too reflect quite closely patterns of clinic utilization. In addition, since vaccinations are given at different ages during infancy they not only provide measures of clinic service utilization but also provide information on utilization patterns at different ages during infancy.

Since DPT and HepB are given at much the same time as Polio1, 2 and 3, these doses of Polio are used as markers for all vaccinations given concurrently. In this study there was no distance effect found for both availability of RTHC and vaccinations for BCG, polio, DPT, HepB and measles and for full vaccination coverage (Table 6.6). For example, the availability of RTHC was 93.7% at 0-5 km, 95% at 6-10 km and 98% at > 10 km. Although these percentages appear to be increasing with distance from the clinic, the differences are not statistically significant ( $p < 0.229$ ). The percentage of fully vaccinated children decreased slightly from 76.1% at 0-5 km to 70.3% at 6-10 km and to 66.7%



beyond 10 km. These results were also not statistically significant ( $p < 0.119$ ). The fact that no distance effect was found for vaccination coverage, suggests quite strongly that distance alone is no barrier to the utilization of clinic services, at least for this critical preventive strategy in childhood. The one possible confounder is the interfering effect of services provided at mobile clinics since vaccinations are also consistently provided at mobile clinics in the study area and these clinics traditionally located in proximity to homesteads most distant from fixed health service points.

**Table 6.6 The effect of distance on child health service utilization**

MCH indicator	0-5 km		6-10 km		> 10 km		Total		P-value
	No	%	No	%	No	%	No	%	
RTHC presented	267	93.7	246	95.0	100	98.0	613	94.9	0.229
BCG	248	87.0	228	88.0	88	86.3	564	87.3	0.886
Polio at birth	248	87.0	228	88.0	88	86.3	564	87.3	0.886
Polio 1	250	87.7	229	88.4	90	88.2	569	88.1	0.968
Polio2	250	87.7	229	88.4	87	85.3	566	87.6	0.717
Polio 3	242	84.9	219	84.6	87	85.3	548	84.8	0.983
Measles	230	84.9	219	84.6	87	85.3	548	84.8	0.983
Fully immunised	217	76.1	182	70.3	68	66.7	467	72.3	0.119

### **6.6.2 Effect of absolute distance on clinic attendance for growth monitoring and for treatment of minor ailments**

Children are routinely monitored for weight at every routine visit to child health clinics. This includes vaccination visits and attendance for minor ailments. It was therefore expected that if there were no distance effects for vaccinations or minor ailments, there also would be not a distance effect for growth monitoring.



This applies to the results from this study which show 89.8% at 0-5 km, 89.6% at 6-10 km and 82.4% at >10 km indicating a downward trend, but this was not found to be statistically significant ( $p < 0.1009$ ). However, the results presented in Table 6.7 shows no distance effect for the number of visits for growth monitoring, with a decrease from 71.2% at 0-5 km to 66.4% at 6-10 km and to 51% at distances beyond 10 km for those children who made more than five visits for growth monitoring ( $p < 0.024$ ).

**Table 6.7 Effect of distance on clinic attendance for growth monitoring**

MCH indicator	1-5 km		6-10 km		>10 km		Total		P-value
	No	%	No	%	No	%	No	%	
No visits	29	10.2	27	10.4	18	17.6	74	11.5	0.024
<5 visits	38	13.3	45	17.4	23	22.5	106	16.4	
5-10 visits	203	71.2	172	66.4	52	51.0	427	66.1	
>10 visits	15	5.3	15	5.8	9	8.8	39	6.0	
<b>Total</b>	<b>285</b>	<b>44.1</b>	<b>259</b>	<b>40.1</b>	<b>102</b>	<b>15.8</b>	<b>646</b>	<b>100</b>	

Table 6.8 shows the effect of distance on clinic attendance for treatment of minor ailments. There was no distance effect for this service for all the minor ailments identified. One of the possible interests in minor ailments as compared with vaccination coverage data is that there may be different health seeking behaviour for routine preventive care i.e. vaccinations than for acute illness as in the case of minor ailments. It is possible to imagine that parents may be more inclined to bring their children to clinic for overt illness than for health care interventions to prevent illness and that the distance effect would therefore be less evident for minor ailments. In fact since there was no distance effect for either minor ailments or vaccination coverage, there was no evidence to support this hypothesis in this study.

**Table 6.8 Prevalence of clinic attendance for treatment of minor ailments**

Condition	1-5 km		6-10 km		>10 km		Total		P-value
	No	%	No	%	No	%	No	%	
Cough	208	77.6	192	77.7	79	79.0	479	77.9	0.96
Diarrhoea	168	62.7	163	66.0	72	72.0	403	65.5	0.24
Fever	141	52.6	109	44.1	50	50.0	300	48.8	0.15
Ear infections	17	6.3	14	5.7	9	9.0	40	6.5	0.52
Eye infections	16	6.0	14	5.7	6	6.0	36	5.9	0.99
Rash	60	22.4	51	20.6	32	32.0	143	23.3	0.07
Sores	68	25.4	63	25.5	30	30.0	161	26.2	0.64
Worms	19	7.1	21	8.5	9	9.0	49	8.0	0.77

## 6.7 Effect of absolute distance on MCH status

The main conceptual framework for this study is that increasing absolute distance from PHC clinics results in decreasing utilization of the services offered at that clinic and that as a consequence of low utilization of these preventive and curative services, mothers and children are at a greater risk for adverse health outcomes. In this study it has been easier to isolate possible indicators of child health status than of maternal health status and therefore the main focus in the following sections will be on the indicators of child health status and their relationship to distance of homesteads from PHC clinics.

These indicators include LBW and nutritional status measured by the level of stunting, underweight for age and wasting. Table 6.9 shows the effect of distance on LBW, stunting, underweight for age and wasting. The values for LBW, underweight for age and wasting were too small to show significant differences between the different distance categories.

Results from this analysis show that the level of stunting was similar in all children living at 0-5 km (25.6%), 6-10 km (27%) and >10 km (24.5%) indicating that there was no distance effect for this indicator of child health status ( $p < 0.87$ ). A relationship between poor service utilization and poor health status has a greater plausibility and is therefore expected to be easier to demonstrate for some indicators of child health status than for others.

For example, if there was a clear distance effect for vaccination coverage, there would be a reasonable expectation that measles incidence would be higher in populations more distant from fixed PHC clinics, since there is a fairly linear relationship between measles vaccination and measles infection. In the case of stunting however, since linear growth is the product of many social and environmental factors and less likely to be ameliorated by interventions offered at clinic alone, it was anticipated that a distance effect would be much more difficult to demonstrate.

**Table 6.9 Effect of distance on child health status**

MCH indicator	0-5 km		6-10 km		>10 km		Total		P-value
	No	%	No	%	No	%	No	%	
LBW	12	5.0	14	7.0	5	6.8	31	6.0	0.63
Stunting	73	25.6	70	27.0	25	24.5	168	26.0	0.87
Underweight	20	7.0	18	6.9	3	2.9	41	6.3	0.30
Wasting	5	1.8	2	0.8	1	1.0	8	1.2	0.57

## **6.8 Effect of absolute distance on MCH-related knowledge and practices**

It was expected that women who lived closer to the clinic would demonstrate high levels of health knowledge and practices as a consequence of more regular contact with the health education services offered at the clinics. The indicators measured were; knowledge about the meaning of the child's growth chart, the benefits of breastfeeding, the correct mixing and hygienic preparation of bottle-feeds and the control of diarrhoea using ORT.

### **6.8.1 Effect of absolute distance on knowledge about growth monitoring, breastfeeding and bottle-feeds**

Table 6.10 shows results of the effect of distance on knowledge about growth monitoring, benefits of breastfeeding, correct mixing and hygienic preparation of bottle-feeds. There was a distance effect for knowledge about growth monitoring. The percentage of responses from women who said that a health worker has ever taught them about growth monitoring decreased with distances beyond 5 km, i.e. 52.5% at 0-5 km, 42% at 6-10 km and 42.9% at >10 km ( $p < 0.035$ ). Similarly, the percentage of responses from women who knew about growth monitoring declined from 50% at 0-5 km to 38.6% at 6-10 km and to 34.3% at distances beyond 10 km ( $p < 0.005$ ). There was no distance effect for knowledge about the benefits of breastfeeding or correct mixing and hygienic preparation of bottle-feeds (Table 6.10).

**Table 6.10 Effect of distance on MCH-related knowledge and practices**

Knowledge indicator	0-5 km		6-10 km		>10 km		Total		P-value
	No	%	No	%	No	%	No	%	
Explanation of growth monitoring by health worker	147	52.5	107	42.0	42	42.9	296	46.8	0.035
Explanation of growth monitoring by respondent	139	50.0	98	38.6	34	34.3	271	42.9	0.005
Explanation of breastfeeding benefits by health worker	234	85.4	205	81.3	84	86.6	523	83.9	0.333
Explanation of breastfeeding benefits by respondent	218	79.3	197	79.8	79	82.3	494	79.9	0.813
Correct mixing of bottle- feeds	140	72.5	132	72.1	57	73.1	329	72.5	0.987
Hygienic preparation of bottle-feeds	187	88.2	176	88.9	78	94.0	441	89.5	0.330

### **6.8.2 Effect of absolute distance on knowledge about control of diarrhoea using ORT**

There was a distance effect for one indicator of knowledge about control of diarrhoea using ORT, i.e. correct mixing of SSS using home ingredients. The percentage of correct responses for this indicator increased from 67.3% at 0-5 km to 67.7% at 6-10 km and to 80.4% at distances above 10 km from the clinic ( $p < 0.033$ ). The reason for this finding is not clear since it was expected that knowledge about control of diarrhoea would decrease rather than increase, with increasing distance from the clinic since health information messages were obtained from the clinic. There was no distance effect for knowledge about mixing and availability of a packet of ORS, availability of home mixing ingredients for SSS within homesteads, the duration of using of SSS after mixing, knowledge about the amount of ORS/SSS to give to a child with diarrhoea, the duration of administration of ORS and breastfeeding practices during diarrhoea (Table 6.11). For example, the percentage of women who knew the duration of using SSS after mixing was 40.3% at 0-5 km, 44.6% at 6-10 km and 38.2% at >10 km ( $p < 0.446$ ).

**Table 6.11 Effect of distance on knowledge about control of diarrhoea using ORT**

Knowledge indicator	0-5 km		6-10 km		>10 km		Total		P-value
	No	%	No	%	No	%	No	%	
Mixing of ORS packet	187	73.3	191	80.3	58	72.5	436	76.1	0.142
Mixing of SSS	191	67.3	175	67.6	82	80.4	448	69.5	0.033
Availability of SSS ingredients	196	69.3	166	64.6	70	68.6	432	67.3	0.488
Availability of ORS packet	34	12.0	25	9.7	9	8.9	68	10.6	0.572
Duration of using SSS after mixing	114	40.3	115	44.6	39	38.2	268	41.7	0.446
Amount of ORS/SSS to give to child	148	53.4	133	53.2	49	49.5	330	52.7	0.781
Duration of ORS administration	260	91.9	231	89.9	92	90.2	583	90.8	0.707
Breastfeeding during diarrhoea	229	84.5	211	84.1	84	84.8	524	84.4	0.981

## 6.9 Effect of potential confounding factors on MCH service utilization and MCH status

Results from a stratified Mantel-Haenszel analysis to adjust for the effect of potential confounding factors show that none of the factors tested (maternal age, parity, maternal education, child's sex, mode of travel and regular visit by CHW) were potential confounding factors (results not shown). Since analysis of distance without these potential confounding factors (Univariate analysis) demonstrated a negligible distance effect for most variables of interest, the lack of demonstrable confounding suggests that, in this study, absolute distance from fixed PHC clinics has a little effect on patterns of MCH service utilization. There was however an interaction between confounding variables and some indicators of MCH service utilization and MCH status (Table 6.12).

In particular, there was evidence that girl children who lived further away from the clinic were less likely to be vaccinated than those children living nearer the clinic (RR= 0.80,

95% CI= 0.71-0.90,  $p<0.01$ ). Similarly multiparous women living further from the clinic had less ability to explain their child's growth pattern on the RTHC (RR= 0.85, 95% CI = 0.98-1.41,  $p<0.043$ ), were significantly more likely to have children who were incompletely vaccinated (RR= 0.8, 95% CI=0.66-0.88,  $p<0.04$ ) and were less likely to deliver at either clinic or hospital (RR=0.69, 95% CI=0.52-0.78,  $p<0.01$ ) than women living closer to the clinic.

**Table 6.12 The interaction between potential confounders and MCH service utilization**

Confounder & MCH indicator	Distance		RR	95% CI	P-value
	%Far	%Near			
Child's sex and vaccination coverage:					
Girl	67.2	84.2	0.80	0.71-0.90	0.01
Boy	71.3	67.6	1.05	0.91-1.22	
Parity and explanation of child's growth chart:					
Multiparity	45.9	54.1	0.85	0.98-1.41	0.043
Uniparity	30.6	46.6	0.66	0.52-0.80	
Parity and vaccination coverage:					
Multiparity	67.5	84.7	0.8	0.66-0.88	0.04
Uniparity	74.7	81.0	0.92	0.77-1.10	
Parity and place of delivery					
Multiparity	36.9	53.3	0.69	0.52-0.78	0.01
Uniparity	22.2	57.1	0.39	0.13-1.14	
Visit by CHW and full vaccination coverage:					
Yes	73.2	74.3	0.98	0.9-1.09	0.0001
No	52.1	91.4	0.57	0.45-0.73	
Visit by CHW and explanation of child's growth chart:					
Yes	43.7	63.8	0.68	0.58-0.75	0.016
No	34.3	42.9	0.80	0.78-0.92	
Education and clinic delivery					
< 7 years schooling	13.0	22.0	0.59	0.38-0.65	0.01
> 7 years schooling	18.4	15.6	1.18	0.64-2.16	

CI = confidence intervals.



Mothers not visited by CHWs and who also lived further from the clinic were significantly less likely to have fully vaccinated children (RR=0.57, 95% CI= 0.45-0.73,  $p<0.0001$ ) and were less able to explain their child's growth charts (RR=0.80, 95% CI=0.78-0.92,  $p<0.016$ ) than women living near the clinic. Women with less than seven years of education were less likely to deliver at clinic (RR= 0.59, 95% CI=0.38-0.65,  $p<0.01$ ) if they lived far from the clinic than women of similar education living near the clinic (Table 6.12).

### **6.10 Effect of other factors of accessibility on MCH service utilization and MCH status**

Since it has been shown previously that absolute distance is not the only determinant of health service utilization and that absolute distances may not reliably reflect access to services in many settings (Airey, 1992; Gilson *et al.*, 1995; Hays *et al.*, 1990; McCaw-Binns, *et al.*, 1995; Phillips, 1990) the purpose of this section is to determine what factors of accessibility other than absolute distance influence MCH service utilization and MCH status. Six other factors of accessibility examined were maternal age, parity, maternal education, mode of transport, child's sex and regular visit by CHW. The first three factors had strong effect on MCH service utilization and the last three showed little or no effect.

All six factors had no effect on MCH status. Maternal age and parity had an effect on all indicators of MCH service utilization except ANC attendance, vaccination coverage for BCG/Polio0 and clinic visits for treatment of minor ailments. For example, women younger than age 35 years with a parity of less than five births utilized family planning and had hospital or clinic deliveries more than women aged over 35 years ( $p<0.004$ ) with a parity of five or more birth ( $p<0.016$ ).



Similarly, possession of RTHC, vaccination coverage, clinic attendance for growth monitoring were higher in women younger than age 35 years with a parity of less than five births than in women aged above 35 years with a parity of five or more (Tables 6.13 and 6.14). The low family planning and delivery service utilization by older women is worrying since it was shown that the highest maternal mortality occurred in women aged 35 years and above. The reason is that this age group is at a risk of pregnancy and childbirth complications (Department of Health, 2000). Therefore, family planning and delivery service utilization by older women is crucial to prevent maternal deaths.

**Table 6.13 Effect of maternal age on MCH service utilization**

MCH indicator	<35 years		≥35		Total		P-value
	No	%	No	%	No	%	
ANC attendance	496	100	109	99.1	605	99.8	0.181
Family planning	221	52.2	65	32.8	286	46.1	0.004
Clinic delivery	80	51.6	25	29.1	105	43.6	0.005
Hospital delivery	263	77.8	112	64.7	375	73.4	0.001
Availability of RTHC	407	96.2	206	92.4	613	94.9	0.029
BCG/Polio0	374	88.4	175	85.5	549	87.4	0.170
Polio1/DPT1/HepB1	380	89.8	174	84.9	554	88.2	0.049
Polio2/DPT2/HepB2	380	89.8	172	83.9	552	87.9	0.024
Polio3/DPT3/HepB3	374	88.4	160	78.0	534	85.0	0.006
Measles	341	80.6	152	74.1	493	78.5	0.040
Fully vaccinated	318	75.2	149	66.8	467	72.3	0.016
Growth monitoring	384	90.8	188	84.3	572	88.5	0.010
Clinic attendance for minor ailments	403	95.7	212	96.4	615	95.6	0.437

**Table 6.14 Effect of parity on MCH service utilization**

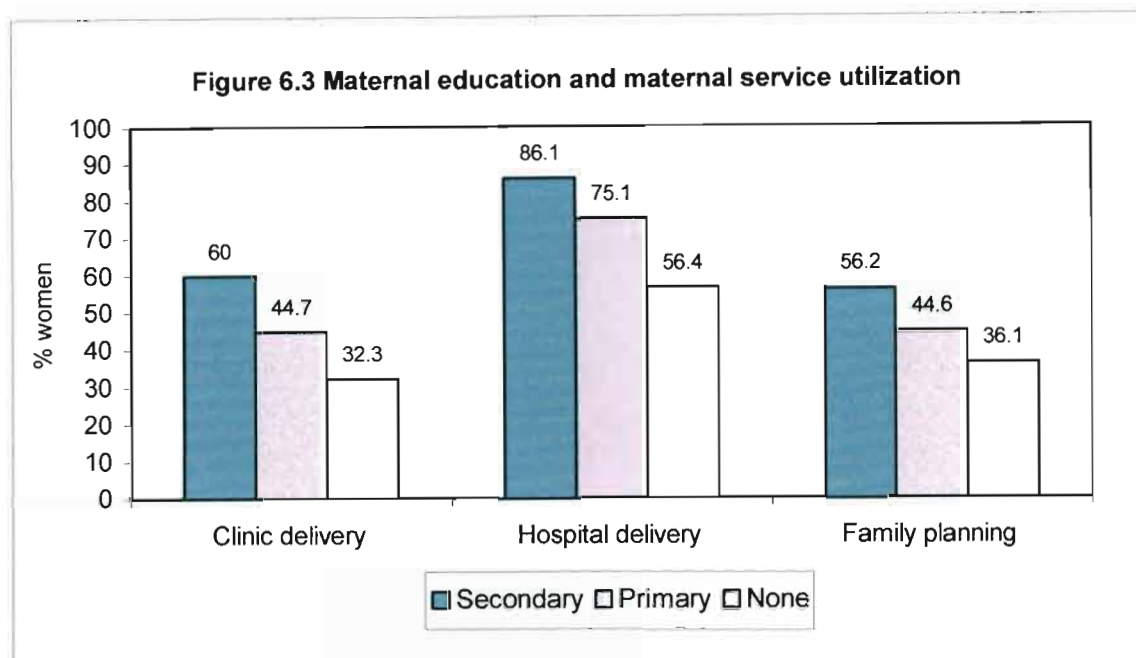
MCH indicator	One		2-4		5-12		Total		P-value
	No	%	No	%	No	%	No	%	
ANC attendance	145	100	310	100	166	99.4	621	99.8	0.256
Family planning	80	55.2	141	45.6	65	38.9	286	46.1	0.016
Clinic delivery	8	7.6	77	53.8	20	26.3	105	43.6	0.0004
Hospital delivery	120	89.6	164	71.3	91	61.9	375	73.4	0.0007
Availability of RTHC	138	95.2	299	96.5	152	91.0	587	94.7	0.039
BCG/Polio0	125	86.1	279	90.0	138	82.6	542	87.1	0.070
Polio1/DPT1/HepB1	126	86.9	283	91.3	138	82.6	547	87.9	0.020
Polio2/DPT2/HepB2	127	87.6	282	91.0	135	80.8	544	87.5	0.006
Polio3/DPT3/HepB3	127	87.6	275	88.7	126	75.4	528	84.9	0.0003
Measles	119	82.1	252	81.3	114	68.3	485	78.0	0.002
Fully vaccinated	112	77.2	233	75.2	103	61.7	448	72.0	0.002
Growth monitoring	128	88.3	286	92.3	134	80.2	548	88.1	0.0006
Clinic visits for minor ailments	138	95.8	298	96.8	156	94.0	592	95.2	0.3600

The effect of parity was also evident in health knowledge and practices about the growth monitoring, the benefits of breastfeeding, hygienic preparation of bottle feeds and control of diarrhoea using ORT (Table 6.15). For example, there were more women with a parity of 2-4 births who knew how to explain the child's growth chart than women with a parity of one or 5-12 ( $p < 0.033$ ). This observation was consistent for other indicators of health knowledge and practices. The results from this survey are consistent with those reported previously for developing countries and South Africa (McCaw-Binns *et al.*, 1995; Joseph & Phillips, 1984; SADHS, 1998).

**Table 6.15 Effect of parity on MCH-related knowledge and practices**

Knowledge indicator	One		2-4		5-12		Total		P-value
	No	%	No	%	No	%	No	%	
Growth monitoring from health worker	53	37.1	154	50.2	76	46.9	283	46.2	0.033
Ability to explain growth chart	50	35.2	148	48.2	64	39.8	262	43.0	0.022
Benefits of breastfeeding by health worker	111	77.1	264	87.4	141	84.9	516	84.3	0.019
Ability to state benefits of breastfeeding	98	69.0	260	86.1	126	77.8	484	79.9	0.0001
Correct mixing of a packet of ORS	89	67.9	225	81.8	104	71.2	418	75.7	0.003
Correct mixing of SSS	90	62.1	230	74.2	110	65.9	430	69.1	0.019
Availability of home ingredients to mix SSS	96	67.1	220	71.2	100	60.2	416	67.3	0.052
Availability of ORS packet	16	11.1	42	13.6	8	4.8	66	10.6	0.012
Breastfeeding during diarrhoea	117	83.6	271	88.6	128	79.5	516	85.0	0.029

Figure 6.3 shows that utilization of hospital or clinic delivery and family planning service decline with increasing level of education. The percentage of clinic deliveries was 32.3% in women without education, 44.7% in women with a primary level of education and 60% in women with a secondary level of education ( $p < 0.003$ ). The corresponding percentages for those women who delivered at the hospital were 56.4% (none), 75.1% (primary) and 86.1% (secondary) at  $p < 0.0001$ . Similarly, utilization of family planning decreased from 36.1% in those women without education to 44.6% in those with a primary education and to 56.2% in those women who have attained a secondary level of education ( $p < 0.0003$ ).



Maternal education was also associated with some of the indicators of MCH-related knowledge and practices as shown in Table 6.16. For example, the percentage of women who knew how to mix bottle feeds correctly increased from 61% in women without education to 70.6% in those women with a primary education and to 82.5% in those women with a secondary education ( $p < 0.002$ ). This finding is consistent throughout Table 6.16. The results agree with what has been found elsewhere and South Africa that the more educated people are, the more likely they will use health services (Abbas & Walker, 1986; Cleland *et al.*, 1988; McCaw-Binns *et al.*, 1995; SADHS, 1998; Toan *et al.*, 1996; Wong *et al.*, 1990).

The analysis of the effects of mode of transport, child's sex and regular visit by CHW found negligible effect or no effect on the indicators of MCH service utilization. With regards to child's sex, boys made more (97.5% vs. 94.5%) clinic visits for treatment of minor ailments than girls ( $p < 0.04$ ) and had more complete vaccinations ( $p < 0.002$ ). The analysis on child's sex was done to determine whether girl children were systematically

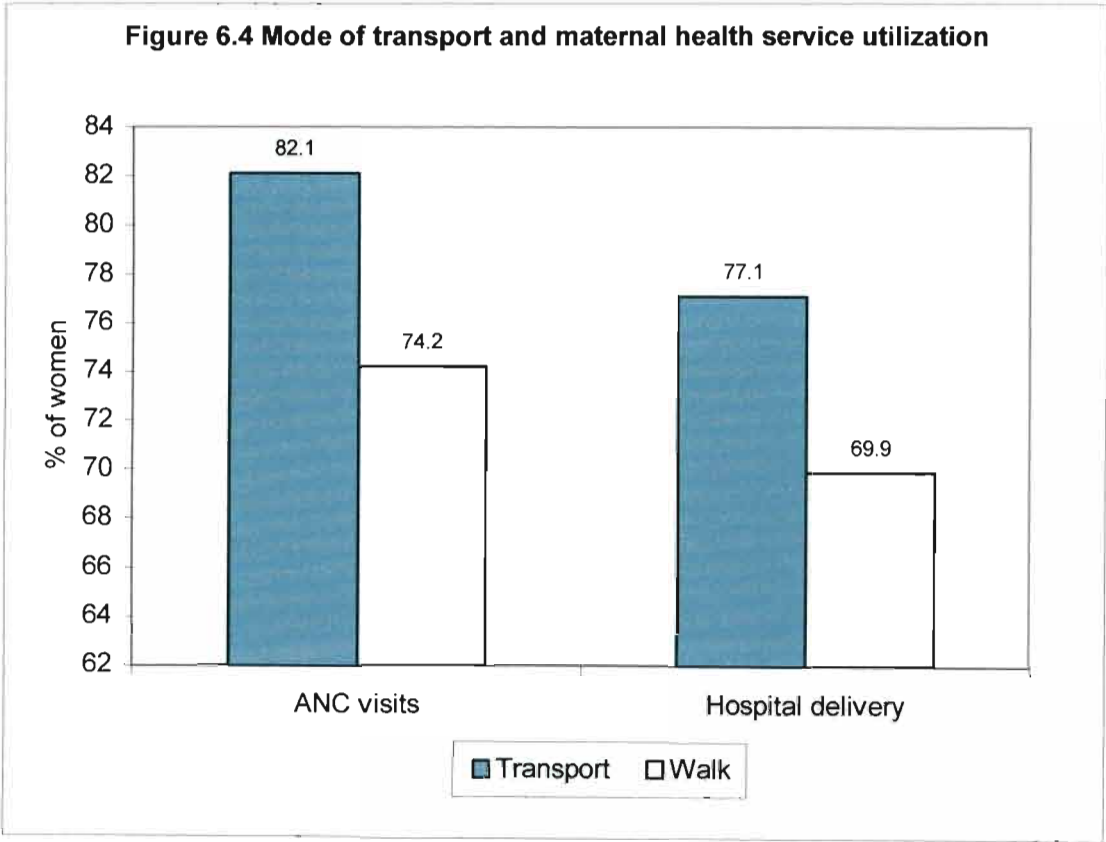
worse-off and disadvantaged compared with boy children, as has been the case in South Asia and West Africa (Ganatra & Hirve, 1994; Koenig & D'Souza, 1986; Rahaman *et al*, 1982). The few associations that were found are trivial and probably coincidental associations. Therefore, the results do not appear to support this hypothesis.

**Table 6.16 Effect of maternal education on MCH-related knowledge and practices**

Knowledge indicator	None		Primary		Secondary		Total		P-value
	No	%	No	%	No	%	No	%	
Growth monitoring	64	34.4	97	41.3	110	52.4	271	42.9	0.001
Correct mixing of bottle feeds	75	61.0	113	70.6	141	82.5	329	72.5	0.002
Hygienic preparation of bottle feeds	113	82.5	154	88.5	174	95.6	441	89.5	0.007
Correct mixing of SSS	117	60.0	177	74.7	154	72.3	448	69.5	0.002
Availability of home ingredients to mix SSS	108	55.4	162	68.6	162	76.8	432	67.3	0.002
Availability of ORS packet	12	6.1	26	11.0	30	14.2	68	10.6	0.030
Duration of using SSS after mixing	65	33.3	103	43.5	100	47.4	268	41.7	0.013

Figure 6.3 shows the effects of transport on maternal health service utilization. Transport was a hindrance for those women attending frequently for ANC ( $p < 0.01$ ) and who had hospital deliveries ( $p < 0.04$ ). It seems that the availability of transport made services more accessible for women who as a result of distance may not otherwise have been able to reach the clinic. Although it was expected that the availability of transport would increase MCH service utilization in women who lived closer to the clinic, the results on adjustment for distance show that there were no differences for this group between women who had access to transport and those without access to transport. Availability of transport did not also make any difference in MCH service utilization between those women who lived far away from the clinic but had access to transport

and those who lived far away from the clinic but travelled on foot to reach the clinic. While Chopra & Wilkinson (1997) found that possession of RTHC and vaccination coverage was higher in children living in areas with CHWs, this study found no effect of regular visits by CHW on both these indicators. For example, Possession of RTHC was 96.2% in those children who lived in homesteads not regularly visited by CHW and 94.6% in those lived in homesteads regularly visited by CHW ( $p<0.345$ ).



**6.11. Discussion**

Based on mean absolute distances of homesteads from clinics in the entire study area before the CUBP it has been concluded that the physical accessibility of fixed PHC clinics in the study area, at least compared with WHO recommendations, was suboptimal. When this assessment was based on usage patterns it is interesting to note that

whereas there was a decrease in use at distances greater than 5 km this fall-off in usage was relatively modest from 86.4% (at 0-5 km) to 79.0% (at 6-10 km) and that for 9 out of 14 clinics this fall-off was much less dramatic than this. There was however a considerable fall-off in usage to 37.8% as distances increased beyond 10km. The full impact of this fall-off in usage with step-wise increases in distance for the study area as a whole was more significant if it was considered that approximately 36.8% of the population in the study area lived 6-10 km from clinics and a further 9.3% lived at a distance of more than 10 km from the nearest clinic. The fall-off in usage to 79% and 37.8% in these distance categories translates to a considerable reduction in effective coverage of the target population by PHC clinic services.

In a more specific assessment of the impact of increasing distances of homesteads from clinics on MCH service utilization and MCH status, distance has been shown to have surprisingly little or no effect on these indicators. In spite of the fact that many homesteads were located at greater than the mandatory limit of 5 km from the nearest clinic, very few significant differences in MCH service utilization and or no significant differences in MCH status have been found between mothers and children living at 0-5 km, 6-10 km or >10 km from these clinics.

A stratified Mantel-Haenszel analysis to adjust for the effect of potential confounders has shown that the distance effect for MCH service utilization was modified by the strata of the potential confounder (interaction) such as maternal age, education and parity. However this analysis has found no true confounding by these potential confounders. This suggests that the lack of a distance effect on MCH service utilization patterns and MCH status is a real observation in a rural and remote South African population and that this is occurring in spite of the failure to meet minimal standards set by the WHO for coverage of the target population by fixed PHC clinics.



It is a surprising finding that this study did not find a distance effect on MCH service utilization patterns and MCH status. This finding may partly be explained by the fact that only 50% of the population, even in one of the most rural parts of South Africa access clinics on foot. Since the traditional assumption has been that these distance effects are a function of straight line walking distances between homesteads and clinics, Euclidian distances alone may be a poor explanatory variable for health service utilization, and, if the hypothesis is valid that health status is a function of service utilization, it may also be a poor explanatory variable for health status of community members who are reliant on these services.

Another explanation could be the fact that data from other sources show evidence that there have been steady declines in both mortality and fertility rates in the study population over the past 10-20 years suggesting that client communities are already benefiting quite substantially from health services in general and from MCH services in particular in spite of residual distance barriers. In other words, a distance effect for service utilization and health status may be more evident in populations with much higher background infant child and maternal mortality rates.

It is possible that distance effect still exists, but that methodological limitations in study design and data collection prevented this study from showing these distance effects. It is possible that the fact that people use mobile clinics for some MCH services may have confounded the effect of distance from fixed clinics. It is also possible that people use different facilities for different services even though they are further away, and the assumption that all facilities have equal attraction for clients, and that the only determinant of use is distance may be flawed. For example, it is evident from this and from other studies in South Africa that whereas most clients use fixed clinics for vaccinations, deliveries are now increasingly conducted at hospitals.



Other methodological issues include the fact that certain health outcomes such as stunting are not an exclusive reflection of health service inputs, but are as much, if not more, a function of social and environmental determinants. Therefore a distance effect will be much more difficult to demonstrate for such indicators. It is clear from this discussion that further investigation into the effect of distance of homesteads from clinics on health service utilization and health status is required and that such investigation should consider the possible methodological limitations identified here. Chapter 7 concludes this thesis and provides recommendations.

## **CHAPTER 7**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **7.1 Introduction**

The Apartheid system in South Africa created substantial fragmentation of health services and inequalities in health service provision. These conditions resulted in less efficient and less accessible public health services. Consequently, different patterns of health service utilization and health status according to population group, geographical region and socio-economic status emerged. Those severely affected were mothers and young children, particularly in rural areas, where many men are absent as a result of the migrant labour system. Mothers and children represent the most vulnerable group in any community and are also responsible for the majority of attendances at first level health facilities.

In order to redress these health inequalities, the South African government committed itself to providing equal access to health for all its population. The National Health Service was transformed according to PHC principles, with a special emphasis on MCH services. The primary goal of providing these services was to reduce morbidity and mortality in women and young children. This transformation process included the provision of free health services for mothers and children aged 0-5 years and the provision of additional fixed PHC clinics through the extensive CUBP. As a result of the CUBP, the number of fixed PHC clinics in South Africa has increased from 2 548 in 1995 to 3 090 in 2000. In the study area the 19 fixed PHC clinics were increased to 35.

In spite of the efforts invested to transform the National Health Service since 1995, evidence from recent surveys conducted in South Africa, indicates that urban-rural differentials in MCH service utilization and MCH status continue to exist. Research conducted in developing countries shows that under-utilization of health services and poor health status are a function of inadequate accessibility of health services. There is therefore, reason to believe that the urban-rural differentials in South Africa are still prevalent as a result of inadequate accessibility of MCH services offered at PHC clinics, since these facilities are the primary point of contact for health care in rural areas.

While accessibility refers to much more than straight-line or absolute distance, evidence from developing countries including Sub-Saharan Africa, shows that absolute distance from PHC facilities is a major determinant of health service utilization and health status in rural areas. For this reason, absolute distance has always been an important consideration in health planning and health facility placement in these countries. Internationally, a distance of 5 km has been set as a norm for placement of health facilities.

In South Africa, there is very little evidence about the relationship between accessibility and health service utilization and health status, in particular, about the absolute distance of homesteads from PHC clinics. This clearly highlights the need for more information that will contribute towards a better understanding of the relationship between accessibility of health services and health service utilization and health status in South Africa. This information is critical in health planning and placement of PHC facilities particularly in rural areas. This study has attempted to contribute towards the understanding of the relationship between accessibility and MCH service utilization and MCH status by exploring the effect of absolute distance of homesteads from PHC clinics on several indicators of MCH service utilization and MCH status in a rural district of

South Africa. To achieve this aim, three broad methodological steps were followed. Each of these steps included calculation of absolute distance using GIS technology. While GIS offers easy and quick applications for relating large spatial and attribute datasets, at the time of this study, GIS in South Africa was an emerging tool, which had not been fully explored to analyse health issues. This chapter summarizes the findings, draws conclusions based on these findings and makes recommendations.

## **7.2 Study subjects and MCH service utilization patterns and MCH status**

The findings reveal that the study population is characterized by a high level of poverty, functional illiteracy, fertility and unemployment rates, which have remained the same for more than a decade. Since these factors have been shown to influence health service utilization and health status in South Africa outside of study area and developing countries, these characteristics were considered in the analysis of the effect of distance on MCH service utilization and MCH status. Other characteristics of the study subjects and homesteads that may influence the effect of distance on MCH service utilization and MCH status include mode of transport, the distribution of homesteads in relation to clinics, maternal age, parity, child's sex and visit by CHW.

Contrary to expectations, the findings show that half the study subjects accessed their PHC clinic on foot. Furthermore, more than half of the homesteads were located at greater distances away from the clinic. While the ages of the women were well distributed, there was a high proportion of teenagers among them. The levels of parity and gravidity suggest that there were relatively few miscarriages and stillbirths in this population.

With regard to CHW visits, the majority of the homesteads have confirmed that CHWs were a well-established part of health services. Since the role of the CHWs is to provide health promotion, it seemed unlikely that their presence would significantly confound the effect of distance on health service utilization and health status.

Of direct relevance to the research question was MCH service utilization patterns and MCH status. The findings show that almost all the women in the survey had attended ANC at some stage during the previous pregnancy and the majority of these women obtained this service from clinics. Again, almost all women had made two or more ANC visits. The findings also showed that the majority of the deliveries occurred at hospitals. Although not specifically asked, evidence elsewhere has shown that distance from health facilities was responsible for the deliveries that occurred at home. Although there was a low rate of family planning uptake, the majority of women obtained this service from the clinics. Since the reasons reported by the women for not utilizing family planning services were personal, it was anticipated that absolute distance would have no effect on this service.

With regard to child health service utilization; possession of RTHCs, vaccination coverage and clinic attendance for growth monitoring and for treatment of minor ailments were high. This left little room to demonstrate the effect of absolute distance of homesteads from clinics on these indicators. An analysis of the indicators of child health status revealed low levels of LBW, underweight and wasting and high levels of stunting. There was reason to believe that the levels of LBW may have been an under-estimate. This is because most LBW children may have been missed by sampling of children aged 12-23 months since LBW children are at a higher risk for neonatal and infant mortality than normal weight children. The levels of stunting remained similar to those reported in South Africa over the past 10-15 years.

Stunting is a reflection of social and environmental factors. Therefore, it is less likely that absolute distance would have an effect on this indicator of child health status. An assessment of the MCH-related knowledge and practices revealed suboptimal levels. Since such information is likely to come from PHC clinics, analysis of the effect of distance on MCH service utilization and MCH status included the indicators of MCH-related knowledge and practices.

### **7.3 Physical accessibility of PHC clinics**

When accessibility was assessed based on catchment areas for PHC clinics, it was found that more than 90% of the catchment population utilized their nearest clinic, suggesting that distance was a valid construct for the planning of health services for this population and other populations in similar settings.

When the assessment of accessibility was based on clinic usage patterns it was found that on average clinic usage decreased with increasing distances above 5 km, but this decrease was much steeper at distances beyond 10 km. An analysis of clinic usage for individual clinics showed that clinic usage decreased at distances above 5km for some clinics and at distances beyond 10 km for most clinics. Although, it is not clear why these two patterns of clinic usage were found, this suggests that cut-offs of 10 km will be adequate for some clinics. However, more investigation is needed before any conclusions can be made regarding this cut-off distance. Furthermore, the decrease in usage at distances above 5 km translates into a considerable reduction in effective coverage of the target population by PHC clinic services, if it is considered that the majority of the population lived greater than 5 km from these clinics.

An assessment of accessibility defined by the determination and comparison of minimum, maximum and mean absolute distances travelled by homestead members for the entire study area before and after the CUBP, showed that the study population travelled a maximum of 30 km and an average of 8.5 km before the CUBP. This assessment also showed that these distances have been significantly reduced after the CUBP. This suggests that the CUBP has improved physical accessibility of clinics by reducing these distances.

However, the full impact of the CUBP on MCH service utilization and MCH status is not known for this population. It was not possible to assess this impact because the new clinics that were introduced through the CUBP were not functional during the data collection phase of this study. Based on these findings it has been concluded that the physical accessibility of fixed PHC clinics in the study area before the CUBP was suboptimal when compared with the WHO recommendations.

#### **7.4 Effect of accessibility on MCH service utilization and MCH status**

An assessment of the effect of distance of homesteads from clinics on specific MCH service utilization and MCH status has shown little effect on these indicators. In spite of the fact that many homesteads were located at distances greater than the mandatory limit of 5 km from their nearest clinic, very few significant differences have been found between mothers and children living at 0-5 km, 6-10 km or >10 km from these clinics. This observation was consistent even after adjustment for the effects of potential confounding factors i.e. maternal age, parity, maternal educational, mode of transport, child's sex and regular CHW visit.

Although not central to this thesis, an analysis of the effects of these factors as independent variables on MCH service utilization and MCH status, found strong effects of the first three factors. This finding is similar to what has been demonstrated elsewhere and in South Africa and reflects that social, environmental and economic conditions of the study population, particularly functional illiteracy, have not improved for more than a decade. This suggests that there is little that the health sector can do to address these conditions, unless other sectors of the government become involved.

In conclusion, at the time of this study physical accessibility of PHC clinics in the study area was not adequate. Furthermore, general clinic usage decreased with increasing absolute distance of homesteads from the clinics. Contrary to expectations, very little evidence was found to support the study hypothesis that increasing distance of homesteads from PHC clinics will result in a decrease in MCH service utilization and MCH status.

The fact that the study found a distance effect for general health service utilization, suggests that distance from PHC clinics provides a reasonable proxy for health service utilization and may have implications for health planning and for health facility placement in South Africa. However, the finding that little or no distance effect was found for MCH service utilization and MCH status is unexpected and could be explained by a number of possibilities. One of these includes the fact that half of the study population accessed their clinic by transport. Initially, it was assumed that the majority of the population in this rural setting would access their PHC clinic on foot. Since the use of transport enables the people to overcome the distance barrier, this makes distance a weak variable for explaining MCH service utilization and MCH status.



Again, since literature has shown a strong association between distance and high mortality rates, it is possible that a distance effect was not demonstrated in this study because mortality rates in the study area and South Africa are currently low. This indicates that the population is already benefiting from health services.

It is also possible that a distance effect still exists, but that methodological limitations in the study design and data collection have prevented this study from demonstrating the effect. For instance, the fact that people use mobile clinics for some MCH services may have confounded the effect of distance from fixed clinics. Again, the fact that people use different facilities for different services even though they are further away. For example, use of fixed clinics for vaccinations and hospitals for deliveries. The reason for this behaviour was discussed earlier in Chapter 5 and has a lot to do with health policies and procedures rather than with distance. Therefore, improving physical accessibility of PHC clinics is unlikely to improve utilization of clinic services for deliveries.

Another explanation could be the fact that certain health outcomes such as stunting, do not exclusively reflect health service inputs, but are a function of social and environmental accessibility rather than physical accessibility. Therefore, a distance effect will be much more difficult to demonstrate for such indicators. Based on these findings and these explanations the following recommendations are made.

## **7.5 Recommendations**

- It appears that the CUBP may have improved physical accessibility of PHC clinics, but since it was not possible for this study to assess the full impact of the CUBP on health services, a detailed assessment of the impact of the CUBP on health

service utilization and health status will provide more information on the benefits of implementing such an intervention in South Africa.

- The results on clinic utilization show that most clinics achieved a high utilization by their natural catchment populations up to 10 km and a few clinics achieved a high utilization up to 5 km. This finding suggests that distance cut-offs of 10 km may well be adequate for some clinics. However, more investigation is needed before any conclusions can be made regarding this cut-off distance.
- Many problems responsible for the majority of women in rural areas to prefer to deliver their babies in the hospitals rather than in clinics are related to quite deep structural problems in the South African health system. Therefore, it seems unlikely that providing clinics closer to homesteads will necessarily reduce the number of home deliveries, unless 24-hour skilled delivery services can be offered at these clinics.
- Evidence from this study shows that the level of stunting has not improved for the past 10-15 years. This indicator of child health status is not influenced by distance from clinics, but by an interaction of social and environmental factors. Therefore, addressing the problem of stunting does not only require efforts from the health sector, but collaboration of other sectors as well.
- It was not possible to assess distance effect for LBW due to small values found for this indicator. It is believed that a significant proportion of LBW infants may have been missed by sampling children in the 12-23 months age group because LBW children are at a higher risk for neonatal and infant mortality than normal

weight children. Therefore, a further investigation is required to determine the true level of LBW and the effect of distance on this indicator in this population.

- An assessment of family planning service utilization showed that the reasons for the low uptake of this service were personal in nature. This suggests that improving physical accessibility of PHC clinics is less likely to increase utilization of this service. Family planning strategies should focus on making this service acceptable to rural populations, particularly men.
- Although an assessment of the effect of other factors of accessibility on MCH service utilization and MCH status was not central to this study, the study found that these factors have very significant effect on MCH service utilization. This does not come as a surprise considering that the social, environmental and economic conditions in the study area remain the same as they were more than a decade ago. While there is very little that the health sector can do to address this problem, assistance from other sectors of the government and the private sector will bring about improvement in living conditions of the population in the study area.
- Also related to the above point is the fact that MCH service utilization was low in women aged 35 years and above with a parity of five or more. Since these factors have been identified as risk factors for high morbidity and mortality in this group, health promotion strategies should emphasize the importance of using MCH services by this group of the population.
- It is possible that explanations provided in section 7.4 regarding limitations in the study methodology may have prevented this study to demonstrate distance effect

for MCH service utilization and MCH status. A further investigation that takes into consideration these methodological limitations will provide a better understanding of the effect of distance on MCH service utilization and MCH status.

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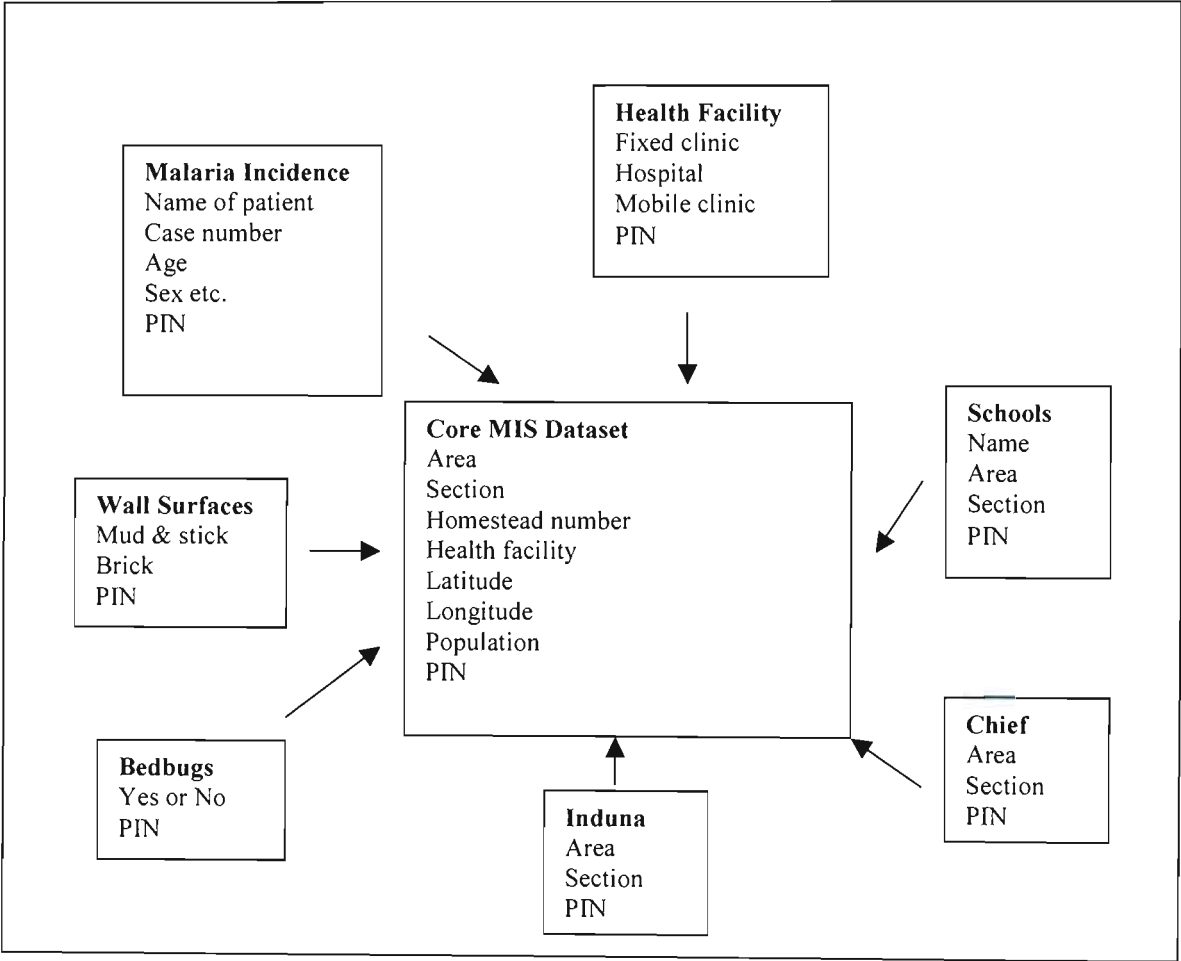
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APPENDICES

Appendix 1 Structure of the MIS database



## Appendix 2 Services offered by PHC clinics in the Umkhanyakude District

Clinic	Madonela	Makhathini	Mbazwana	Ophansi	Ntshongwe
<b>Opening Times</b>	7H00	8H00	8H00	7H30	7H30
<b>Closing Times</b>	17H00	17H00	16H30	16H30	16H30
<b>Services Offered</b>					
Monday	Chronic	Minor	Minor	Chronic	Minor
Tuesday	Minor <sup>1</sup> & Doctor's day	Chronic	FP & Well-baby	Minor & Doctor's day	ANC
Wednesday	ANC <sup>2</sup>	ANC	Minor & Doctor's day	ANC	Minor & Doctor's visit
Thursday	FP <sup>3</sup> & Well-baby	FP & Well-baby	ANC	FP & Well-baby	FP & Well-baby
Friday	Minor	Minor	Chronic	Minor	Chronic
Saturday	Emergencies	Emergencies	Minor	Emergencies	Minor
Sunday	Emergencies & Office work	Emergencies & Office work	Emergencies & Office work	Emergencies & Office work	Emergencies & Office work

(Source: Clinic schedules, 1998)

### Key

1 Minor ailments or general diseases.

Only the main service offered on each day is shown in the table. All clinics offer minor ailments on a daily basis when necessary.

2 ANC = antenatal clinic

3 FP = family planning

## Appendix 3 MCH questionnaire

### MATERNAL AND CHILD HEALTH STUDY

#### A. SURVEY OF MOTHERS/CAREGIVERS OF CHILDREN 12-23 MONTHS OF AGE

- 1.01 TEAM NUMBER (1-3) [ ]
- 1.02 AREA *(from malaria card)* \_\_\_\_\_
- 1.03 SECTION (1-10) *(from malaria card)* [ ][ ]
- 1.04 CLINIC NAME
- 1.05 BUFFER RADIUS (km) [ ][ ]
- 1.06 POINT NUMBER [ ][ ][ ][ ]
- 1.07 HOUSEHOLD NUMBER *(from malaria card)* [ ][ ][ ]
- 1.08 DATE OF INTERVIEW dd / mm / yy
- 1.09 ARE THERE ANY CHILDREN IN THIS HOUSEHOLD BETWEEN THE AGES OF 12 AND 23 MONTHS OF AGE?

(1) YES

(2) NO

*(If yes, proceed with the rest of the questionnaire, if no, exclude from the study)*

- 1.10 IS IT NECESSARY TO REVISIT THIS HOUSEHOLD? <sup>1</sup>

(1) YES

(2) NO

*If applicable, possible date(s) <sup>2</sup> of proposed visit*

dd / mm / yy

- 1.11 IS IT NECESSARY TO VISIT CHILD'S CRECHE <sup>3</sup> OR PRESCHOOL?

(1) YES

(2) NO

*If applicable, provide name of crèche:*

#### GENERAL

#### RESPONDENT<sup>4</sup>

- 2.01 AGE OF RESPONDENT: \_\_\_\_ YRS
- 2.02 IS THE RESPONDENT STILL AT SCHOOL? (1) Yes (2) No
- 2.03 IF YES, WHAT IS THE PRESENT STANDARD ?
- 2.04 IF NO, WHAT WAS THE HIGHEST STANDARD ACHIEVED?

<sup>1</sup> Criteria for revisiting households are as follows:

1. Mother of child unavailable but will be returning on next day or on coming weekend.

2. Child unavailable but will be returning on next day or on coming weekend.

3. Road to health card not accessible on day but will be available on next day or on coming weekend.

<sup>2</sup> If mother only available on weekend, state whether available on both Saturday and Sunday and enter both dates

<sup>3</sup> Criteria for visiting crèche are as follows:

1. Child at crèche on day of household visit

<sup>2</sup> RTHC at crèche on day of household visit

<sup>4</sup> If the mother will not be available respondents should be child's caregiver.

- 2.05 IS SHE ABLE TO READ OR WRITE?  
 (1) Yes (2) No (9) DK/NR
- 2.06 WHAT IS THE RELATIONSHIP OF THE RESPONDENT TO THE CHILD?  
 (1) Mother (4) Granny  
 (2) Father (5) Other family member  
 (3) Sibling (6) Non-family member
- 2.07 WHO NORMALLY LOOKS AFTER THIS CHILD DURING THE WEEK?  
 (1) Mother (4) Granny  
 (2) Father (5) Other family member  
 (3) Sibling (6) Non-family member

*(Only mothers of children aged 12-23 months of age will be interviewed beyond this point. If respondent is not the biological or adopted mother proceed to the B section of the survey).*

**SURVEY OF HEALTH AND SERVICE UTILISATION** (MEASUREMENT OF DISTANCE RELATIONSHIP)

- 3.01 WHICH IS YOUR NEAREST RESIDENTIAL CLINIC?  
 (1) Madonela (4) Ntshongwe (9) DK/NR  
 (2) Makhathini (5) Ophansi  
 (3) Mbazwana (6) Other:\_\_\_\_\_.
- 3.02 DID YOU ATTEND (name of clinic above) FOR ANTENATAL CARE WHEN YOU WERE PREGNANT WITH THIS CHILD?  
 (1) Yes (2) No (9) DK/NR  
 If no, where do you attend for antenatal care\_\_\_\_\_.
- 3.03 DID YOU ATTEND (name of clinic above) FOR DELIVERY OF THIS CHILD?  
 (1) Yes (2) No (9) DK/NR  
 If no, where are your babies born?\_\_\_\_\_.
- 3.04 DID YOU ATTEND (name of clinic above) FOR IMMUNISATION AND WEIGHING OR SICKNESS OF THIS CHILD IN THE 2 WEEKS AFTER BIRTH?  
 (1) Yes (2) No (9) DK/NR  
 If no, where do you go for postnatal care\_\_\_\_\_.
- 3.05 DO YOU USE MORE THAN ONE CLINIC OR HEALTH POINT FOR THESE PURPOSES?  
 (1) Yes (2) No
- 3.06 HOW DO YOU GET TO (*Insert the name of the clinic*) CLINIC?  
 (1) Walk (2) Paid transport (bus, taxi)  
 (3) Private transport (4) Other:\_\_\_\_\_.
- 3.07 IF YOU PAY FOR YOUR TRANSPORT, HOW MUCH DO YOU PAY?  
 (1) < R2 (2) R2- R3 (3) R4 - R6  
 (4) > R6 (9) DK/NR



- 3.08 HOW LONG DO YOU TAKE TO REACH YOUR CLINIC?  
 (1) <15 min (4) 1-2 hours  
 (2) 15-30 min (5) >2 hours  
 (3) 31-60 min (9) DK/NR
- 3.09 IS THE CLINIC YOU USE NEAR OTHER FACILITIES? (e.g. shop, pension point, school etc.)  
 (1) Yes (2) No (9) DK/NR
- 3.10 IS THERE A MOBILE CLINIC IN YOUR AREA?  
 (1) Yes (2) No, go to 3.12 (9) DK/NR  
 If yes, give name: \_\_\_\_\_.
- 3.11 FOR WHICH SERVICES DO YOU USE THIS MOBILE CLINIC?  
 (1) ANC/FP (4) Other: \_\_\_\_\_.  
 (2) Well baby clinic (5) Never used  
 (3) Minor ailments (9) DK/NR
- 3.12 WHAT IS YOUR NEAREST HOSPITAL?  
 (1) Mseleni (4) Mosvold  
 (2) Bethesda (5) Other: \_\_\_\_\_.  
 (3) Manguzi (9) DK/NR
- 3.13 FOR WHICH SERVICES DO YOU USE THIS HOSPITAL?  
 (1) ANC/FP (4) Other: \_\_\_\_\_.  
 (2) Well baby clinic (5) Deliveries  
 (3) Minor ailments (6) Never used (9) DK/NR
- 3.14 IF A CLINIC WAS CLOSER, WOULD YOU USE IT MORE  
 (1) Yes (2) No (9) DK/NR
- 3.15 IF A CLINIC WAS FURTHER AWAY, WOULD YOU USE IT LESS  
 (1) Yes (2) No (9) DK/NR
- 3.16 IS YOUR HOUSE VISITED BY A COMMUNITY HEALTH WORKER?  
 (1) Yes (2) No (9) DK/NR
- 3.17 IF YES, WHAT IS THE NAME OF YOUR COMMUNITY HEALTH WORKER?  
 \_\_\_\_\_ (9) DK/NR
- 3.18 WHEN WERE YOU LAST VISITED BY YOUR COMMUNITY HEALTH WORKER?  
 (1) Within the last month  
 (2) 2-3 months ago  
 (3) 4-6 months ago  
 (4) more than 6 months ago  
 (9) DK/NR
- 3.19 Please give any comments on your residential clinic

**A. ANTENATAL CARE, SAFE DELIVERY, AND POSTNATAL CARE (MOTHERS ONLY)**

- 4.01 PARITY<sup>5</sup>:
- 4.02 GRAVIDITY<sup>6</sup>:
- 4.03 HOW MANY LIVE BIRTHS HAVE YOU HAD SO FAR?  
 \_\_\_\_ Number of live births (9) DK/NR
- 4.04 WHAT IS THE AVERAGE BIRTH INTERVAL?  
 Fill out date of birth of first born dd/mm/yy (validate with RTHC/unvalidated)  
 Fill out date of birth of last born dd/mm/yy (validated/unvalidated)  
*This question will be coded later, so do not fill in next line*  
 (1) > 24 months (2) < 24 months (9) DK/NR
- 4.05 HOW MANY OF THESE CHILDREN ARE STILL ALIVE TODAY?
- 4.06 HOW MANY MONTHS WERE YOU PREGNANT WITH THIS CHILD BEFORE YOU STARTED WITH ANTENATAL CARE?  
 (1) 3 months (first trimester)  
 (2) 4-6 months (second trimester)  
 (3) 7-9 months (third trimester)  
 (4) DID NOT ATTEND  
 (9) DK/NR
- 4.07 HOW MANY TIMES DID YOU GET ANTENATAL CARE?<sup>7</sup>  
 (1) Once (2) 2-4 times (3) 5 or more (9) DK/NR
- 4.08 DID ANYONE ADVISE YOU TO GET ANTENATAL CARE?  
 (1) Yes (2) No (9) DK/NR
- 4.09 IF YES, WHO GAVE YOU THIS ADVICE?  
 (1) Doctor, nurse (5) Mother, relative  
 (2) Community nurse/midwife (6) Friend, neighbour  
 (3) CHW (7) Other: \_\_\_\_\_  
 (4) traditional birth attendant (9) DK/NR
- 4.10 DID YOU HAVE AN INJECTION (TETANUS) IN YOUR UPPER ARM DURING YOUR LAST PREGNANCY?  
 (1) Yes (2) No, go to 4.13 (9) DK/NR, go to 4.13
- 4.11 HOW MANY TETANUS VACCINATIONS DID YOU RECEIVE?  
 (1) One (2) Two  
 (3) Three or more (9) DK/NR
- 4.12 WERE YOU ASKED TO TAKE IRON TABLETS EVERYDAY THROUGHOUT YOUR LAST PREGNANCY?  
 (1) Yes (2) No (9) DK/NR
- 4.13 WHAT WAS THE OUTCOME OF YOUR MOST RECENT PREGNANCY?  
 (1) Live birth  
 (2) Still birth

<sup>5</sup> number of times a woman has given birth (include live and stillbirths - count 2 for twins)

<sup>6</sup> number of times a woman has fallen pregnant (include those pregnancies ending in miscarriage)

<sup>7</sup> If mother knows the number of times enter exact number, anything else is DK.

(3) Abortion/miscarriage, go to 5.01

(9) DK/NR, go to 5.01

4.14 WHERE WAS THIS BABY BORN?

(1) Hospital

(2) Clinic

(3) Home (4) Other: \_\_\_\_\_.

4.15 WHO WAS THE MAIN PERSON ATTENDING THE DELIVERY?

(1) Doctor, nurse, nurse-midwife

(4) Other: \_\_\_\_\_.

(2) TBA or CHW

(5) No one

(3) Relative, neighbour, friend

(9) DK/NR

### **FAMILY PLANNING**

5.01 ARE YOU CURRENTLY LIVING WITH A PARTNER (SEXUALLY ACTIVE)?

(1) Yes

(2) No

(9) DK/NR

5.02 ARE YOU OR YOUR PARTNER CURRENTLY USING ANY FAMILY PLANNING METHOD?

(1) Yes

(2) No, go to 5.07

(9) DK/NR, go to 5.07

5.03 FOR HOW LONG HAVE YOU BEEN CONTINUALLY PRACTISING FAMILY PLANNING?

(i.e. continually using one method or another without interruption)

(1) < 3 months

(4) 1-2 years

(2) 4-6 months

(5) 3-4 years

(3) 7-12 months

(6) 5 years or more

(9) DK/NR

5.04 WHICH IS THE MAIN METHOD YOU OR YOUR PARTNER ARE USING NOW?

(1) Tubectomy

(6) Condom

(2) Ukusoma

(7) Foam, jelly, cream, diaphragm

(3) IUD

(8) Safe period, withdrawal, abstinence

(4) Oral pill

(9) Other:

(5) Injection

(99) DK/NR

5.05 WHAT IS THE MAIN SOURCE OF YOUR FAMILY PLANNING SERVICE OR SUPPLIES?

(1) Hospital

(4) Clinic

(2) Field worker

(5) Other:

(3) Mobile clinic

(9) DK/NR

5.06 PROVIDE THE NAME OF THE FACILITY (HOSPITAL, CLINIC OR MOBILE) WHERE YOU ARE ATTENDING FOR FAMILY PLANNING \_\_\_\_\_. (9) DK/NR

5.07 WHAT IS THE MOST IMPORTANT REASON YOU ARE NOT USING FAMILY PLANNING NOW?

(1) Want more children

(6) Method/service unavailable

(2) Husband objects

(7) Fear of sterility

(3) Health reasons

(8) Breast feeding

(4) Religious reasons

(9) Pregnant

(5) Fear side effects

(10) Other:

(99) DK/NR

**B. SURVEY OF CHILDREN AGED 12-23 MONTHS****RESPONDENT<sup>8</sup>**

- 1.01 IS THE ROAD-TO-HEALTH-CARD AVAILABLE  
(1) Yes (2) No (9) DK/NR
- 1.02 DATE OF BIRTH OF THIS CHILD (*Please confirm with the mother*):  
(1) dd/mm/yy (9) DK/NR
- 1.03 IF DATE OF BIRTH PROVIDED IN 1.02, WHAT IS THE SOURCE OF THIS INFORMATION?  
(1) Road to health card (2) Birth or baptismal certificate  
(3) Mother (4) Other: \_\_\_\_\_
- 1.04 WHAT IS THE SEX OF THE CHILD?  
(1) MALE (2) FEMALE

**IMMUNIZATION**

FILL VACCINATION RECORD INTO TABLE PROVIDED BELOW: <sup>9</sup>

- |      |   | Date received   |
|------|---|---|
| 2.01 | BCG   | dd/mm/yy ( <i>If no date on RTHC, check child's right arm</i> ) |
| 2.02 | POL <sup>0</sup>  | dd/mm/yy  |
| 2.03 | POL <sup>1</sup>  | dd/mm/yy  |
| 2.04 | DPT <sup>1</sup>  | dd/mm/yy  |
| 2.05 | HEPB <sup>1</sup>   | dd/mm/yy  |
| 2.06 | POL <sup>2</sup>  | dd/mm/yy  |
| 2.07 | DPT <sup>2</sup>  | dd/mm/yy  |
| 2.08 | HEPB <sup>2</sup>   | dd/mm/yy  |
| 2.09 | POL <sup>3</sup>  | dd/mm/yy  |
| 2.10 | DPT <sup>3</sup>  | dd/mm/yy  |
| 2.11 | HEPB <sup>3</sup>   | dd/mm/yy  |
| 2.12 | MEAS <sup>1</sup>   | dd/mm/yy  |
| 2.13 | MEAS <sup>2</sup>   | dd/mm/yy  |
| 2.14 | POL <sup>4</sup>  | dd/mm/yy  |
| 2.15 | DPT <sup>4</sup>  | dd/mm/yy  |
| 2.16 | HAS THE CHILD VISITED A CLINIC DURING THE FIRST YEAR OF LIFE FOR ANY ILLNESS BESIDES FOR WEIGHING AND IMMUNISATION? |   |
|      | (1) YES   | (2) NO (3) DK/NR  |

- 2.17 IF YES, WHAT WAS THE REASON?

Yes

No

<sup>8</sup> Either the mother or the primary caregiver is the respondent

<sup>9</sup> a) If vaccination given and date available from RTHC:

- fill in exact date

b) If vaccination given on history but no RTHC:

- fill in as "R"

c) If no vaccination given:

- fill in as "0"

d) If unknown

- fill in as "DK/NR"

- (1) DIARRHOEA
- (2) COUGH/ RTI
- (3) FEVER
- (4) OTHER:
- (5) DK/NR

2.18 FROM RTHC INDICATE THE NUMBER OF TIMES THIS CHILD HAS VISITED THE CLINIC OTHER THAN IMMUNISATION OR GROWTH MONITORING? \_\_\_\_\_.

### GROWTH MONITORING/NUTRITION EDUCATION

#### ANTHROPOMETRIC MEASUREMENTS

3.01 WEIGHT: \_\_\_\_\_ KG                      3.03 MUAC: \_\_\_\_\_ CM  
3.02 LENGTH: \_\_\_\_\_ CM

#### FROM RTHC (if no RTHC go to 3.10)

- 3.04 WHAT WAS THE CHILD'S BIRTH WEIGHT <sup>10</sup> ?  
\_\_\_\_\_ KG
- 3.05 HOW MANY TIMES WAS THE CHILD WEIGHED DURING THE FIRST YEAR OF LIFE <sup>11</sup> ?  
\_\_\_\_\_.
- 3.06 HOW MANY TIMES WAS THE CHILD'S WEIGHT PLOTTED ON GRAPH IN THE FIRST YEAR OF LIFE? <sup>12</sup>
- 3.07 IS THE CHILD'S WEIGHT TODAY <3RD %LE ON RTHC?  
(1) Yes                      (2) No, go to 3.10                      (9) DK/NR
- 3.08 AT WHAT AGE DID THE CHILD EITHER NOT GAIN WEIGHT OR LOSE WEIGHT FOR THE FIRST TIME? <sup>13</sup>  
\_\_\_\_Months                      (9) DK/NR
- 3.09 AT WHAT AGE DID CHILD'S WEIGHT FALL AND STAY BELOW THE 3RD %LE? <sup>14</sup>  
\_\_\_\_Months                      (9) DK/NR

#### FROM CAREGIVER

- 3.10 HAS ANY HEALTH WORKER EVER EXPLAINED THE WEIGHT CHART TO YOU ?  
(1) Yes                      (0) No                      (9) DK/NR
- 3.11 CAN YOU EXPLAIN THE GROWTH CURVE ON THE RTHC TO ME ? <sup>15</sup>

<sup>10</sup> If a child was not born at hospital or clinic but was weighed at a health delivery point within two weeks of birth take this weight as the child's birth weight.

<sup>11</sup> Count all weights recorded during the child's first year of life that either appear in the text or on the graph. Care must be taken to compare the weights on the graph with those in the text and to avoid double counting weights.

<sup>12</sup> If weights are less than 3 weeks apart should not be counted. Do not count birth weight in this question

<sup>13</sup> This question is only relevant if the child lost or did not gain weight over a period of 2 or more months. For any shorter period tick DK/NR.

<sup>14</sup> The age at which the child's weight first crossed and stayed below the 3rd centile.

<sup>15</sup> Mother/caregiver is able to explain the growth chart if she does the following:

- (1) Yes, mother can interpret the information correctly  
 (2) No, if mother cannot interpret or interprets incorrectly  
 (9) DK/NR

### **BREAST FEEDING**

- 4.01 IS THIS CHILD PRESENTLY BEING BREAST FED?  
 (1) Yes (2) No (9) DK/NR
- 4.02 HOW LONG AFTER THIS CHILD WAS BORN, WAS HE/SHE STARTED ON BREASTFEEDING?  
 (1) Within 3 hours  
 (2) After a day  
 (3) Not breast-fed, go to 4.07  
 (9) DK/NR, go to 4.07
- 4.03 AT WHAT AGE OF THIS BABY WILL YOU/DID YOU STOP BREAST FEEDING?  
 \_\_\_ months (9) DK/NR
- 4.04 DID ANY HEALTH WORKER TEACH YOU THE BENEFITS OF BREAST FEEDING?  
 (1) Yes (2) No (9) DK/NR
- 4.05 CAN YOU EXPLAIN WHY IT IS IMPORTANT <sup>16</sup> TO BREAST FEED? (Probe)  
 (1) Knows (2) No, does not know (9) DK/NR

### **BREAST MILK SUBSTITUTES**

- 4.06 HAS THIS BABY EVER BEEN GIVEN FORMULA OR MILK OTHER THAN BREAST MILK?  
 (1) Yes (2) No (9) DK/NR
- 4.07 WHICH MILK OR FORMULA WAS THIS CHILD GIVEN? <sup>17</sup>  
 (1) Nespray / Klīm (6) Cow's milk  
 (2) Pelargon (7) Infasoy/Isomil  
 (3) Lactogen (8) Other: \_\_\_\_\_  
 (4) S26/Similac/Nan/SMA (9) DK/NR  
 (5) Sour milk
- 4.08 HOW IS THE BABY GIVEN THE MILK OR FORMULA?  
 (1) Bottle (2) Cup (9) DK/NR
- 4.09 AT WHAT AGE WAS THIS CHILD STARTED ON WATER, FORMULA OR ANY OTHER LIQUID FEED OTHER THAN BREAST MILK?  
 \_\_\_ months (9) DK/NR
- 4.10 WHO ADVISED THAT THE CHILD BE STARTED ON FORMULA OR MILK OTHER THAN BREAST MILK?  
 (1) Clinic nurse (5) Pharmacy  
 (2) Community health worker (6) Advertisement/article  
 (3) Doctor (7) Other: \_\_\_\_\_

a) correctly states whether child's growth is good or bad;  
 b) correctly explains how the chart shows this.

<sup>16</sup> Importance of breast feeding - knows the importance if mentions any 2 of the following benefits viz. protects against infection, healthiest food for her baby, cheap, convenient, reassures and comforts her baby.

<sup>17</sup> This applies to the first milk or formula that was introduced

(4) Family member or friend

(9) DK/NR

## 4.11 WHY WAS THE CHILD STARTED ON FORMULA OR MILK?

(1) Not enough breast milk

(5) Went to work

(2) Mother unwell

(6) Back to school

(3) Painful/cracked nipples

(7) Other:

(4) Baby unable to suck

(8) Recommended by family member

(9) DK/NR

4.12 CAN YOU EXPLAIN HOW FORMULA FEEDS ARE MIXED? <sup>18</sup>

(1) correctly mixed

(9) DK/NR

(2) Incorrectly mixed

4.13 CAN YOU EXPLAIN HOW MILK OR FORMULA FEEDS ARE PREPARED <sup>19</sup> FOR THIS CHILD?

(1) Hygienically prepared

(9) DK/NR

(2) Unhygienically prepared

## 4.14 PLEASE TELL US WHERE YOU OBTAIN YOUR WATER

(1) Clean source <sup>20</sup>

(2) Unclean source

(9) DK/NR

**DIARRHOEAL DISEASE CONTROL/ORT**5.01 DO YOU KNOW WHAT IS MEANT BY "DIARRHOEA" ? <sup>21</sup>

(1) Knows

(2) Does not know

(9) No response

*Then explain what we mean by diarrhoea and ask the following questions:*

## 5.02 HAS THE CHILD HAD DIARRHOEA IN THE LAST 6 MONTHS?

(1) Yes

(2) No, go to 5.06

(9) DK/NR, go to 5.06

5.03 HOW LONG DID IT LAST? <sup>22</sup> (-----hours;-----days)

(1) Severe

(2) Not severe

(9) DK/NR

## 5.04 DID YOU DO ANYTHING TO TREAT IT OR JUST LET IT RUN ITS COURSE?

(1) Treated it

(2) Let it stop on its own - go to 5.06

(9) DK/NR - go to 5.06

5.05 HOW DID YOU TREAT IT? (*tick as many as you can*)

(1) Treated it myself with a packet of ORS

(2) Treated it myself with home-made SSS

(3) Treated at home with other fluids besides ORS or SSS

(4) Took child to relative/ neighbour

<sup>18</sup> Correctly mixed, if 1 level teaspoon per 25 ml water. Anything else is incorrectly mixed.<sup>19</sup> Hygienically prepared indicates added water is clean or boiled, bottles and teats are washed with clean or boiled water or sterilized and hands are washed before preparation of feed. Anything else is unhygienically prepared<sup>20</sup> Clean source includes tap, pump, borehole, raintank or protected spring<sup>21</sup> "Diarrhoea" is the passage of frequent (3 or more) watery stools in the previous 24 hours.<sup>22</sup> "Severe" Diarrhoea if 3 or more days. Anything less than 3 days "is not severe".

- (5) Took child to CHW  
 (6) Took Child to clinic  
 (7) Took child to hospital  
 (8) Other (*specify*):  
 (9) DK/NR

- 5.06 CAN YOU EXPLAIN HOW TO MIX A PACKET OF ORS ? <sup>23</sup> (Probe)  
 (1) Correctly mixed (2) Incorrectly mixed (9) NR
- 5.07 CAN YOU EXPLAIN HOW TO MIX SUGAR SALT SOLUTION FROM HOME INGREDIENTS? <sup>24</sup> (probe)  
 (1) Correctly mixed (2) Incorrectly mixed (9) NR
- 5.08 ARE THE REQUIREMENTS FOR HOME-MIXING AVAILABLE IN THIS HOUSEHOLD? <sup>25</sup>  
 (1) Yes (2) No (9) DK/NR
- 5.09 IS THERE A PACKET OF ORS IN THIS HOUSEHOLD?  
 (1) Yes (2) No (9) DK/NR
- 5.10 HOW LONG CAN SSS BE USED AFTER MIXING?  
 (1) Knows (1 day) (2) Does not know (9) DK/NR
- 5.11 HOW MUCH ORS or SSS HAVE YOU BEEN TAUGHT TO GIVE A CHILD WITH DIARRHOEA?  
 (1) Knows (2 cups after each loose stool)  
 (2) Does not know  
 (9) DK/NR
- 5.12 HOW LONG CAN YOU ADMINISTER ORS TO A CHILD WITH DIARRHOEA?  
 (1) Knows (until the diarrhoea ends)  
 (2) Does not know  
 (9) DK/NR
- 5.13 IF THE CHILD IS STILL BREAST FEEDING, DO YOU CONTINUE  
 BREAST FEEDING DURING DIARRHOEA?  
 (1) Yes (2) No (9) DK/NR

### C. SURVEY OF SOCIO-ECONOMIC FACTORS AND CLINIC UTILISATION

- 1.01 HOW MANY CHILDREN ARE THERE IN THIS HOUSEHOLD?  
 BETWEEN THE AGES OF 0-15 YEARS?  
 \_\_\_\_ children (6) DK/NR
- 1.02 HOW MANY CHILDREN PER MOTHER?  
 (1) M<sub>1</sub> \_\_\_\_ (3) M<sub>3</sub>  
 (2) M<sub>2</sub> \_\_\_\_ (4) DK/NR

<sup>23</sup> Correctly mixed = add contents of packet to 1 litre of clean or boiled water. Anything else is incorrectly mixed.

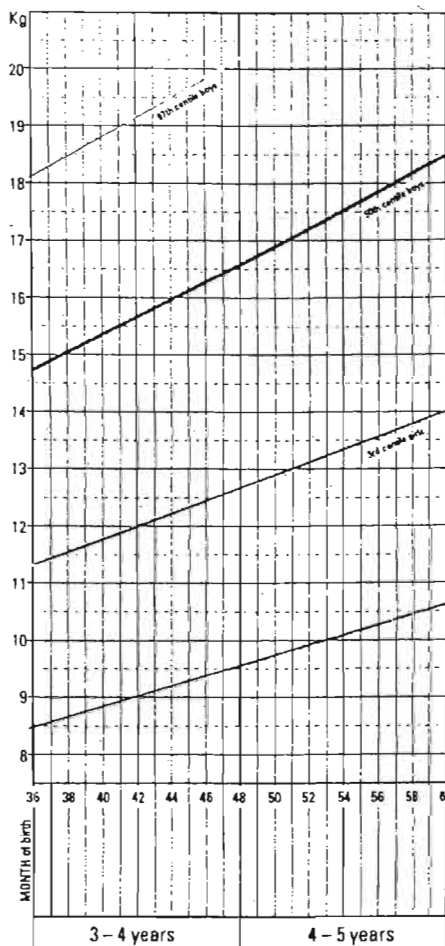
<sup>24</sup> Correctly mixed = add 8 teaspoons of sugar and half a teaspoon of salt to 1 litre of clean or boiled water.

<sup>25</sup> Yes, if they have a litre container, sugar, salt and a teaspoon available at home.



- 1.03 HOW MANY CHILDREN IN THIS HOUSEHOLD ATTEND SCHOOL?  
 \_\_\_\_children (9) DK/NR
- 1.04 IS THERE ANY PENSIONER IN THE HOUSE?  
 (1) Yes (2) No  
*If yes, give total number-----.*
- 1.05 IS THERE ANY MIGRANT WORKER IN THE HOUSE?  
 (1) Yes (2) No  
*If yes, give total number-----.*
- 1.06 DO THEY ASSIST TO SUPPORT THE FAMILY?  
 (1) Yes (2) No (3) DK/NR
- 1.07 IF THE PENSIONER/MIGRANT WORKER ASSIST THE FAMILY, HOW?  
 (1) Give money  
 (2) pay school fees  
 (2) buy food/clothes  
 (4) Other,-----
- 1.08 DO YOU HAVE ANY OF THE FOLLOWING HOUSEHOLD VALUABLES/ASSETS?
- |               | Yes | No |
|---------------|-----|----|
| (1) furniture | —   | —  |
| (2) radio     | —   |    |
| (3) fridge    | —   |    |
| (4) TV        | —   |    |
| (5) car       | —   |    |
- 1.09 *(The interviewer must check for the following)*  
 (1) *no of structures within each homesteads*  
 (2) *house type:*  
 (a) \_\_\_\_traditional (hut)  
 (b) \_\_\_\_traditional (sticks)  
 (c) \_\_\_\_modern (tin roof)  
 (3) *number of each type:*  
 (a) \_\_\_\_traditional (hut) plus windows  
 (b) \_\_\_\_traditional (sticks) plus windows  
 (c) \_\_\_\_modern plus windows (d) \_\_\_\_without windows
- 1.10 DO YOU HAVE ANY OF THE FOLLOWING LIVESTOCK?
- |       | (1) Yes | (2) No | (3) How many? |
|-------|---------|--------|---------------|
| Cows  | —       | —      | —             |
| Goats | —       | —      |               |
| Sheep | —       | —      |               |

THANK YOU FOR YOUR CO-OPERATION!!!



Acknowledgement to: TALC (Teaching and Learning Centre)

## Road to Health Chart

Department of Health

**IMPORTANT:** always take this card with you when you visit any health clinic, doctor or hospital, and present the card on school entry.

Child's name  boy ☐ girl ☐

Date of birth  day  month  year  Place of birth

Birth weight  Birth length  Birth head circumference

Problems during pregnancy / birth / neonatally

APGAR 1 min.  10 min.  Gestational age (wks)  Serology

Mother's file numbers - Antenatal  Delivery

IMMUNISATIONS		PRIMARY		BOOSTERS	
	Date given	Signature		Date given	Signature
B.C.G.	1		2		
Polio	0		4		
	1		5		
	2				
	3				
DTP	1		4		
	2		DT		
	3				
Hep. B	1				
	2				
	3				
Meas	1		2		
Other	1		3		
	2		4		
Vit A	1		4		
	2		5		
	3				

Remember to discuss child spacing

Clinic 1  Clinic 2  GW 6/133

Address  Address

Mother's name

Father's name

Caretaker if not the mother

Where does the child live?

How many children has the mother had?

Number born  Number alive now

**SPECIAL NEEDS** (circle if answer becomes YES)

Was the baby less than 2.5kg at birth ☐ yes

Is this baby a twin ☐ yes

Is this baby bottle fed ☐ yes

Does the mother need more family support ☐ yes

Are any brothers or sisters underweight ☐ yes

Are there any other reasons for taking extra care for example - tuberculosis, single parent etc.

Vision screening (4½ - 6 yrs) ☐ date  Result L:  R:

Hearing screen (7 to 8 months) ☐ date  Result L:  R:  Manchester ☐ Rattle used ☐

**CARD GIVEN AND MOTHER TAUGHT BY**

**ORAL REHYD- Taught**

**RATION DATES** Used

**TUBERCULOSIS SCREENING**

Heaf / Mantoux / Time  Date  Grade

TB contact

TB notified

