

A cost analysis of rural primary health care (PHC)  
services in KwaZulu-Natal (Master's Dissertation)

Student: Thembakazi Matsheke

Supervisors: C. Muheki

Prof. D. McIntyre

Health Economics Unit, Public Health Department

University of Cape Town

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**DECLARATION**

I, Thembakazi Matsheke, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicated otherwise), and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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**Signed by candidate**

Signature

\_\_\_\_\_  
Date 16/08/2004

Supervisors: Miss C. Muheki  
Prof. D. McIntyre

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## EXECUTIVE SUMMARY

It has been found that South Africa has very limited costing information of health services at both primary and higher levels of care. Therefore, a study was conducted in Ingwavuma health district, a rural setting in KZN, evaluating costs of primary health care (PHC) services. The primary objective of the study was to evaluate the costs of providing PHC services in a rural setting and to compare costs of providing PHC services at different levels of care. Costs data were collected through interviews and record reviews from Manguzi hospital, a district hospital, and nine clinics operating within the hospital's catchment area. Cost comparisons between Manguzi clinics and between the clinic and hospital levels were undertaken. Variations in terms of costs between similar facilities (clinics) were discovered, with some clinics being more costly compared to others. Such variations can be explained by some input costs, e.g. personnel which varied considerably between facilities. Variations in the personnel costs between similar facilities were found to be linked with staff distribution patterns and facility utilisation.

In the comparison of hospital and clinic levels, the hospital was found to be relatively more costly.

In addition, variations in terms of costs were also discovered between services provided within one facility. For instance, expenditure figures revealed that the largest proportion of resources was spent on curative services. Tuberculosis and mental health services consumed a minimum amount of resources, namely about 1%.

Further comparison of Manguzi results with those of the Centre for Health Policy (CHP) was undertaken. Costs analyses of PHC services provided at Manguzi clinics with similar facilities compared to other sites, namely Agincourt (a rural setting), and Alexandra Health Centre (AHC) (an urban setting), were undertaken. Manguzi and Agincourt have similar costs of PHC services. However, AHC has relatively higher costs compared to the other two sites. This is probably because Manguzi and Agincourt are both rural.

Finally, analysis on scaling-up PHC services in Manguzi to the essential package target of 3.5 utilisations per person per year shows that there would be no additional staff costs required. The current staffing levels in Manguzi seem to be sufficient to provide a comprehensive PHC package of 3.5 visits per person per year.

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## LIST OF ABBREVIATIONS

AHC	Alexandra Health Centre
PHC	Primary Health Care
EHP	Essential Health Package
KZN	KwaZulu-Natal
SASS	South Africa Statistics Services
SA	South Africa
STD's	Sexually Transmitted Diseases
TB	Tuberculosis
WB	World Bank
WDR	World Development Report
BoD	Burden of Diseases
DALY's	Daily Adjusted Life Years
NDoH	National Department of Health
FMS	Financial Management Services
DH	District Hospital
DHS	District Health Services
CHP	Centre for Health Policy
KM	Kilometres
AA	Automobile Association
OPD	Outpatient
IPD	Inpatient
WHO	World Health Organisation
UC	Umbumbulu clinic
HSHC	Halley Stott Health Centre
NHA	National Health Accounts
CBO	Community Based Organisation
NGO	Non-governmental Organisation
CPI	Consumer Price Index
HEU	Health Economics Unit
DHER	District Health Expenditure Reviews

## 1. INTRODUCTION

### 1.1 Background

It is stated in the literature that there are very few costing studies conducted in South Africa and they provide very limited information, especially on costs at different levels of care (Valli et al 1991; Ferrinho et al 1993). It is therefore recommended in the literature that similar studies, that is cost analyses, together with comparative studies need to be conducted (Broomberg and Rees 1993). Hence a cost analysis of rural primary health care (PHC) services was done in Ingwavuma district in KwaZulu-Natal. The study evaluated the costs of providing PHC services at clinic and district hospital levels of care. It is hoped that the findings of the study will inform not only facility managers, but also planning and decision-making processes by providing information on the costs of providing PHC services in a rural setting.

Seemingly, little attention had been given to the PHC concept as countries' health systems have been characterised with lack of access to health care (Thipanyana and Mavundla 1998). The Alma Ata conference aimed at redressing such problems resulting from geographic, political and financial circumstances by providing cost effective health care which is accessible to all, especially those not covered by medical aid (Thipanyana and Mavundla 1998). The Alma Ata conference recommended a more comprehensive approach to primary health care, covering important aspects of health affecting the vulnerable populations. However, its wide scope had been considered expensive (Ensor et al. 2002), therefore, in order to reduce the cost of health care, a selective approach which is capable of dealing with diseases of the vulnerable populations as well as reducing costs of care was recommended (Bobadilla et al. 1994; Cowley et al. 1995).

Similar to other countries South Africa began to consider PHC as a vehicle toward achieving better health (NDoH, 2002). As a result of political history, the health care system in SA had been characterised by fragmented health services and lack of access to health care by some population groups. Until recently when the SA health system underwent transformation, the

distribution of health care resources had not been based on need (Thomas and Muirhead, 2000) and it focused on urban-tertiary institutions leaving the rural and small facilities functioning with very limited resources. Moreover, such institutions were only used by a small proportion of the population. As a consequence, the number of people seeking health care at higher levels of care due to poor quality of care at lower levels increased. It is therefore worth noting the link between lower and higher levels of care as the former determines the costs of the latter. In other words, under-resourced lower levels of care have cost implications at higher levels.

Despite having adopted a comprehensive primary health care approach which was the strategy to increase utilisation by all populations, inequalities in resource allocation continued even after the transformation (Thomas and Muirhead 2000). Hence it is important to evaluate the costs of health care provision to inform planning and decision-making on the resources required to provide services and to assess whether or not services are provided efficiently.

Cost analysis studies have been performed on various aspects of health care interventions. Such studies have been conducted with different objectives but the main aim is usually to improve health services delivery. The absence of cost data may result in both allocative and technical inefficiency.

In addition, findings of costing studies are not only useful for policymaking, but are important in management as well (Broomberg et al. 1993). Mismanagement of resources, in some instances, is a consequence of lack of cost data. Managing services without knowing the costs they incur may result in overuse of resources, which might have been prevented if the cost information was available. Managers need to be informed not only about the quantities of resources spent but also about how they have been spent. Costs analysis provides information on resource expenditure patterns between various services. From that information, it can be determined whether resources have been utilised efficiently or not.

The Ingwavuma health district in KwaZulu-Natal (KZN) has been chosen as the area to conduct this costing study. KwaZulu-Natal is one of South Africa's provinces with high population density of about 92.3 people per/km<sup>2</sup> (Bamford 1999). The demographic structure in KZN is composed of 82.7% Africans and 9.2% Asians (Statistics Services 1996). The South African Statistics Services (SASS) report (1996) shows that, the annual per capita income of KZN was R6, 157 in 1993 compared to the national average of R8,704. High population density, low-income levels and the use of unhealthy energy resources, such as paraffin and wood for cooking, are some of the factors contributing to the poor health state of the population. Population health status is one of the determinants of the health costs (Meerding et al. 1998).

Ingwavuma district is mainly rural, has nineteen clinics and two hospitals (Manguzi and Mosvold) and a population size that is estimated to be about 2 million in 2000. The socio-economic conditions are generally poor with high unemployment, low-income and low levels of education and also poor access to basic services such as clean water and sanitation (Barnes et al.2001).

## 1.2. Research questions

The study attempts to address the following questions:

- What does it cost the government to provide PHC services in rural areas in KwaZulu-Natal?
- To what extent do the costs of district health services at different levels of care differ?
- Are there differences in resource consumption at facilities of the same type?
- To what extent does the cost of PHC services in a rural sub-district differ from the national estimated PHC package costs?

The findings of this study can be useful in planning, budgeting and management at district level as they inform managers on the costs of health services provided within the district.

### 1.3. Aim of the study

The aim of the study is to evaluate the cost of outpatient services at district level of care from a public provider's perspective and to compare health care costs at different levels of health care in rural KwaZulu-Natal.

The study objectives are as follows:

- To calculate the total expenditure on health services at the Manguzi hospital outpatient department and clinics operating within this hospital's catchment area.
- To calculate unit costs at each facility for specific health service categories such as child health, Sexually Transmitted Diseases (STD's), adult curative, chronic care, immunisation, notifiable diseases such as malaria and tuberculosis (TB) and mental health services.
- To compare health care costs at different levels of care.
- To compare the unit costs of some PHC services at different facilities of the same level.
- To calculate the PHC package cost in Manguzi sub-district and compare it with the NDoH estimated costs.

This thesis is structured as follows; the second chapter provides a review of literature on costing of health services. Chapter 3 outlines methods that have been used in data collection and analysis. Analysis and discussion follow the methodology chapter, presenting the results of the study. The last chapter outlines conclusions and recommendations.

## 2. LITERATURE REVIEW

### 2.1. Definitions of key terms

#### 2.1.1. Financial vs. Economic costs

In cost analysis, it is important to distinguish between economic and financial costs. The latter focuses on monetary values while the former deals with other forms of costs, which cannot be easily measured in monetary terms (Carrin 1984; Robinson 1993; Kernick 1998). The third type of cost is termed 'intangibles', meaning items of unknown value, which include lost leisure and volunteer time (Kernick 1998). The choice of the type of costs to analyse depends on the study objectives.

#### 2.1.2. Recurrent vs. capital costs

When analysing costs of health service inputs, all resources have to be classified into cost categories (Creese and Parker 1994). There are two major cost categories, namely, capital and recurrent costs. Capital resources are the resources with a longer lifespan than their recurrent counterparts (Creese and Parker 1994). The lifespan of the capital input is expected to be a year or more (Creese and Parker 1994; Clewer and Perkins 1998).

Examples of capital inputs or resources are:

- ◆ Buildings
- ◆ Vehicles
- ◆ Equipment
- ◆ Furniture
- ◆ Training and so forth.

Recurrent costs are costs which are incurred annually. Examples of recurrent input costs are as follows:

- ◆ Consumables

- ◆ Maintenance
- ◆ Electricity
- ◆ Administration
- ◆ Water
- ◆ Salaries

Most capital resources have both capital and recurrent costs. For example, buildings, vehicles and equipment have a capital cost of construction and purchasing and a recurrent cost of maintenance. In the evaluation of such inputs, recurrent and capital costs should be separated. A detailed method for calculating these costs will be discussed in chapter 3.

#### **2.1.3. Fixed vs variable costs**

Fixed and capital costs share some commonalities in that capital costs can be regarded as examples of fixed costs. Fixed costs can be defined as the costs which are not easily influenced by level of output. Unlike fixed costs, variable costs vary with the level of output. In other words, maximisation of output affects these costs. Examples of such costs include drug and consumable costs.

#### **2.1.4. Efficiency**

Efficiency is another common term in costing and is defined as undertaking activities in the best possible way (Witter and Thompson 2000; Ensor et al. 2000). Services are regarded as efficient if the outcomes produced with the allocated resources are favourable (Creese and Parker 1994). Efficiency is categorised as technical and allocative efficiency. The former is defined as the undertaking of activities with minimum costs, in other words obtaining maximum benefits with given resources (McGuire et al. 1998; Henderson et al. 1988; Getzen 1997; Clewer and Perkins 1998). Technical efficiency can be obtained through minimisation of costs while the output is maximised (McGuire et al. 1998). Apart from the emphasis on maximisation of output, the quality of care has to be retained. Once the quality becomes unsatisfactory, utilisation levels become low.

On the other side, allocative efficiency can be achieved through channelling resources to the services which produce the greatest health gains (Witter et al. 2000). In order to improve allocative efficiency, resources have to be directed to the most productive use (Witter et al. 2000). This implies that programmes with the potential to overcome community health problems for instance, need to be equipped with the necessary resources. Allocative efficiency happens when it is impossible to make one individual better off without this being at the expense of others (McGuire et al. 1998; Henderson et al. 1988; Clewer and Perkins 1998). In other words, the way in which resources are allocated should not privilege some services or people at the expense of others. Allocation of resources in many instances is likely to focus on higher levels of care leaving lower levels operating with insufficient resources (Green et al. 2001). The link between lower and higher levels often receives little consideration in planning even though under-funding of lower levels of care impact on quality of care and eventually translate into low health care seeking behaviour among users. It is therefore detrimental to deprive lower levels of care of resources since they play a role in reducing the number of patients seeking health care at higher levels of care. Focusing on higher levels of care may be allocatively inefficient because lower levels services have a higher impact on health resources deployed and by treating minor conditions and public health concerns in time services at lower levels of care prevent the need for costly care at higher levels.

As it is important to know how resources were used, it is therefore important as well to compare average costs between facilities. Variation in the average costs between similar facilities can sometimes be reflecting inefficiencies in service delivery (Hanson and Gilson 1993). However, it is acknowledged that the average costs of different facilities can be influenced by various factors including utilisation; type of resources used e.g. variable vs. fixed inputs and the quantity of resources available in a facility. Therefore, variations in the average costs between similar facilities do not necessarily imply inefficient service delivery in one facility.

## **2.2. Relevance of cost analyses**

The need to improve efficiency in care delivery and the rising costs of health care provision, attracted attention of many researchers to analyse health care costs which health providers incur (Flessa 1998). Evaluation of health costs at health facilities could possibly lead to identification of areas of improving health care delivery through reduction of some costs (Flessa 1998). For example in the cost analysis of health services in Diepkloof, it was found that excess personnel in administration contributed to high unit costs, hence cutting down the number of personnel could reduce costs (Broomberg and Rees 1993). However, reduction of personnel numbers should be done carefully to ensure that it does not impact negatively on quality of care. In the Diepkloof costing study, staff reduction was on non-clinical staff, hence the quality of care was not at risk of being compromised. Without the cost data, inefficient resource use would have continued to prevail.

Cost analysis studies have been undertaken for different reasons. Some studies are purely interested in finding out the costs related to health care provision. Such information is important in planning and budgeting as it shows the average amount of resources required for providing a specific service at a particular facility, thereby encouraging efficiency in healthcare delivery.

### **2.2.1. Factors influencing cost differences**

Some costing studies do not end at evaluating costs only but they go further by comparing costs of services. Differences in costs between various services may be a consequence of various factors including size, setting (rural vs. urban) and utilisation level, population characteristics, number and the type of personnel, use of fixed and variable cost items, level of care and so forth. However, in such analyses, it is important to include comparable facilities. For instance, comparison of one large, urban facility with a small rural facility on the costs of services would be inappropriate. It would not be easy to distinguish the influence of each factor on costs.

The setting in which services are provided determines the costs of care. Health services provided in rural areas are likely to have high expenditure on certain costs categories such as transport. High expenditure on transport in rural areas result from long distances and poor infrastructure such as bad roads. This was found in Tanzanian church hospitals study where the transport cost per inpatient was high in rural areas due to long distance driving on bad roads (Flessa 1998). In rural areas where access to health service is limited due to distances that have to be travelled, mobile clinics are often used as another alternative in such situations. Despite its costs, mobile care eases access to health care in rural areas where access to health care services is problematic.

It is often anticipated that rural costs would be much higher than the urban as health services provided at rural areas have lower levels of utilisation. As a determinant of the unit cost, utilisation has an impact on the costs of services. Highly utilised services are likely to have relative lower unit costs.

Population characteristics and type of services provided also influence health care costs at the health facilities. As Meerding et al. (1998) argue, demographic composition and health status of a society are determinants of costs of health care. Some health services are more costly than others and therefore imply high expenditure on such services. A society with heavy burden of diseases impacts negatively on health care costs and expenditure. In low socio-economic communities with high unemployment rates and poverty, it is common to find high prevalence of diseases associated with living conditions. If the expenditure levels on services in that particular community are compared to those in a different situation, the one with high disease burden would have high expenditure. Population characteristics often differ in different communities. Some areas have a population dominated by a certain gender or age group. Such features have implications for costs and the type of services required. For example, a community with elderly people dominating has the likelihood of having high health care costs. Like children, elderly people utilise health care services more than other age categories.

The quantity and the type of personnel at health facilities also have a major effect on expenditure (Valli et al. 1991). Some services have excess personnel capacity. To reduce personnel cost, reduction in the number of personnel would be necessary. It is important to avoid excess in personnel especially in the non-clinical category as it can lead to unnecessary expenditure. In a Tanzanian hospital, as was the case in Diepkloof, excess personnel were found in non- medical categories (Flessa 1998). Excess personnel in such categories worsen inefficiency in the provision of health services since the number of non-clinical staff does not have a direct impact on the quality of clinical care, rather it increases personnel cost (Flessa 1998). The quantity of the most critical staff categories such as doctors and the nursing personnel, in most cases determines the quality of care. This does not necessarily mean that to increase the quality of care, medical personnel need to be enlarged. However, the personnel number has to be in proportion with the utilisation. This implies that, relatively highly utilised facilities require more resources than less utilised facilities. Therefore, it is important to employ the required personnel quantity and in addition with necessary skills and be placed in levels of care according to the skills required at each level. At higher levels of care, it is common to find highly trained personnel, as some services require the services of highly trained personnel. Such services are likely to be expensive, as higher salaries have to be paid. Therefore when comparing the unit costs of different services, the type of personnel delivering the service is one of the important factors to consider.

Another source of differences may result from fixed and variable costs. The former remains constant even when output has changed whereas the latter changes with the level of output (Drummond et al. 1986). Changes in variable costs affect the total cost of a service and consequently affects the unit cost as well.

Apart from cost comparison between services at different facilities, comparison of costs between different levels of care seems to be limited. Cost of care between various levels of health care varies. This is a consequence of the type of resources used and location of the particular health services. Services provided by facilities of the same level of care are likely

to have similar costs. It is acceptable that even though the services may be provided from the same level facilities may not have equal costs. The lower levels are expected to have lower cost and become high in high levels of care. However, in a study in Pakistan, the difference in cost between high and lower levels was not clear (Green et al. 2001).

### **2.3. Costing methodologies**

For the purposes of the costing study of the outpatient services in Manguzi sub-district, it is important to, first differentiate between health services costing and district health expenditure reviews (DHER) as both sound similar. DHER focus on overall resource expenditure at district level. It is therefore, broader than costing in that "it presents a clearer picture of the funding, distribution of health care resources within the district" ([http://www.hst.org.za/isds/dist\\_exp.htm](http://www.hst.org.za/isds/dist_exp.htm)). Moreover, costing is a more detailed approach in that it focuses on specific areas of health services, providing information on expenditure and costs of specific services within facilities under study.

Both analyses are useful in management of health care resources but at different levels. For example, information from DHER is more useful at district level management whereas costing data is more useful at facility level management.

#### **2.3.1. Costing guidelines**

Some guidelines need to be followed when undertaking a costing study. For example, it is important to know the perspective which the study would take in analysing the costs. Some studies measure costs from both provider and community perspectives whereas some measure costs from only one perspective. The choice of perspective to take is subject to study objectives. A cost analysis from the provider's perspective ignores or excludes costs to the patients. Even though the societal perspective is the most favourable point of view, there have not been many studies that have used it. Although societal perspective provides costs of both sides, patient and provider, it can be time-consuming, hence costly. In addition, such a broader perspective can be mostly used when intending to improve health care for the patients. For the study evaluating cost of PHC services in the Ingwavuma health district, costs were measured from the provider's perspective.

Similar to choosing the study perspective, the type of approach to use in collecting data has to be chosen. Cost data can be collected retrospectively or prospectively. Prospective studies results are more likely to give the actual costs as some adjustments can be made for the study to be more accurate as record keeping is encouraged (Mills et al. 1993). However, from the literature, the retrospective approach is most commonly used in spite of its possible problems, such as data gaps, ways in which records are kept which sometimes complicates data collection. This study used a retrospective approach.

### **2.3.2. Costing approaches**

Different costing approaches can be used when undertaking costing. Two costing approaches are discussed, i.e. step-down and ingredient approaches.

In the ingredients approach, calculations of costs are based on aggregated data of either one facility or groups of facilities. Such analysis provides estimation of facility average costs and therefore allows comparison between facilities. This approach requires that costs and services information to be related in that data being analysed must be of the same period and for the facilities of the same level as well as similar geographic setting. This therefore enables comparison of different facilities. Although the approach can be easily used in that it requires less time but it does not provide as detailed an analysis of costs (Barnum and Kutzin 1993) as its step-down counterpart.

In costing studies, step-down costing approach is the most commonly used. In step down cost analyses, the total facility expenditure is allocated to cost centres or departments. Records of each department have to be reviewed to analyse the costs incurred in a particular period. Depending on the aim of cost analysis, the costs of each cost centre can be allocated to specific health services based on chosen 'allocation basis'. The unit cost of output is measured from total cost of each cost centre against the output level. One of the advantages of the step down approach is that it provides information which allows comparison of costs between departments. Comparison can be within one facility service or

even across various facility services (Barnum and Kutzin 1993). Despite being a favourable approach, step-down approach has its shortcomings. For instance, poor record keeping in some facilities can make it impossible to calculate the departmental costs.

Since the cost analysis of the primary health services in the Ingwavuma district in KZN is interested in evaluating and comparing cost of different services at different facilities, a step-down approach was used. Shephard et al. (1998), in the analysis of hospital costs mentioned stages that should be followed when undertaking a costing study. These are as follows (Shephard, Hodgkin et al. 1998):

- ◆ Definition of final product of costing, and cost centres
- ◆ Identification of the full cost of each input (identify each input and then value them)
- ◆ Allocating inputs to cost centres and allocation of costs to cost centres
- ◆ Calculation of the unit cost of each cost centre

And finally, results of the study

It is important to be clear from the outset what the study intends to evaluate. This can be answered by the purpose of the study. Some studies measure the unit of output from specific cost centres and hence, it is important as well to know the cost centres the study aims at evaluating.

The discussion below focuses on two stages of costing, that is, identification and valuation of inputs and allocation of costs to costs centres.

#### **2.4. Valuation of costs**

The overall expenditure at a facility is not a useful guide for management, as it cannot tell resources have been spent on different line items. It is interesting to know the expenditure and costs of each line item and how they contributed to the overall expenditure.

Below is the discussion on methods of quantifying both capital and recurrent inputs.

#### **2.4. 1. Capital costs**

The value of some capital items such as vehicles equipment and furniture is measured by replacement cost which is obtained by using the current prices in the market of purchasing new capital items (Drummond et al.1986). However, for buildings the replacement value can be measured by calculating costs of constructing a new building. When the replacement value is obtained, it has to be annualised. The annual cost of capital items have to be calculated by using a discount rate. Usually, all capital items are given same discount rate.

In evaluating capital costs, there is often an assumption about the lifetime of the capital items. All capital items such as buildings; vehicles, equipment and so forth have a different lifespan. Usually the buildings are given longer lifespan, but in most cases evaluator's decisions are influenced by the literature.

Various types of equipment and furniture with different quality can be given different lifespan. In most studies the lifespan given to the equipment and furniture is 10 years (Kirigia et al. 1998; Shephard et al. 1998).

Like other capital items, the value of vehicles is measured by the current market value and life span is usually estimated to be between 6-10 years (Mills 1993; Kirigia et al. 1998).

Buildings are usually given a lifespan of about 30 years and a discount rate of about 3-10% (Mills 1993; Kirigia et al. 1998; Shephard et al. 1998). However, the choice of discount rate to use is usually influenced by literature.

## **2.4. 2. Recurrent Costs**

Methods used in calculating recurrent cost vary according to each category of recurrent costs. Such methods in which these costs are calculated are discussed below.

### **2.4.2.1. Personnel costs**

In health services, the largest proportion of expenditure is often spent on personnel salaries. Data on the quantity of resources spent on personnel can be obtained from expenditure reports but other methods of calculating these can be used. In a Malawian study, district hospital personnel costs were estimated using type and grade of an individual staff member and mid-point of the salary scale (Mills et al. 1993). Actual expenditure on staff benefits could not be easily obtained and 10% was added as adjustment for benefits (Mills et al. 1993). Although estimations and adjustment made do not reflect the actual expenditure on personnel they are accepted in the event of unavailability of data. However, this kind of data should be treated with caution as it may lead to improper planning. As one of the objectives of costing studies, data collected from costing studies is mainly used for improving efficiency in health, it is important to know the available data is useful and reliable in that it reflects the actual situation. Therefore, in such circumstances where there is insufficient personnel cost data, sensitivity analysis is important to undertake to assess the influence of the assumptions made.

### **2.4.2.2 Consumables**

In calculating the cost of consumables, it is important to find the quantity used in a specified period. Hence, it is important to have a well-defined period for the costing. Some studies are interested in expenditure and costs of a short period and some look at the costs for the year. Consumable costs are usually obtained from expenditure reports.

### **2.4.2. .3. Drugs**

Due to the rising cost and significance of drugs in health care, considerable attention is paid to evaluating the costs of drugs. Data on drug costs are usually available in pharmacy

records. Some facilities keep records of the quantity and cost of drugs ordered. That therefore simplifies calculation of drug costs. In the evaluation of costs of district hospital in Malawi the quantity and value of drug used was obtained from the requisition forms (Mills et al.1993; Kirigia et al. 1998). Requisition forms have been used as an alternative method of quantifying drug costs when there is no actual data on drugs cost.

#### **2.4.2. 4. Utilities**

Some recurrent cost items have shared costs, that is, they are used by more than one department (Drummond et al. 1986). Expenditure on utilities is usually found on expenditure records and that include electricity, water, administration and maintenance costs.

#### **2.4.2.5 Vehicles**

In calculating the recurrent costs of vehicles, total number of kilometres travelled has to be calculated. This allows estimation of the fuel used but it does not cover all the recurrent costs such as maintenance. Although it is rare to find maintenance costs data recorded, some facilities record it separately. In South Africa, Automobile Association (AA) rates are used to calculate vehicle-running costs which include both fuel and maintenance costs, when such data are unavailable at facility level.

#### **2.4.2.6. Donated Items**

A currency for costing items has to be identified when doing cost analysis (Creese and Parker 1994). A problem in valuing donated items is that they often come from another country. Therefore one needs to find the value in foreign currency and convert it to local currency using the exchange rates.

The table below summarises the mostly common methods used in quantifying cost items based on the international literature.

**Table 2.1: Summary of techniques of quantifying cost items**

Author	Study Site	Personnel	Drugs	Vehicle	Building	Equipment	Source of Data
Mills, et al (1993)	Malawi	Mid-point of salary scale plus 10% for employment benefits	Central medical store prices applied to quantities of drugs	Replacement cost	Replacement cost	Replacement cost	
Kirigia, et al (1998)	Kenya	Salaries and benefits of all staff	Private pharmacy prices applied to quantities of drugs	Not Available	Not Available	Not Available	Interviews & expenditure published estimates
Soderlund, et al (1993)	Developing countries	Estimated proportional usage	Not Available	Not Available	Not Available	Estimated proportional usage	Project Coordinator/Published studies
Kirigia, et al (1998)	Kenya	Salaries and benefits of all staff	Drugs were valued at average pharmacy prices	Replacement cost and equivalent annual value	Replacement cost and equivalent annual value		Expenditure records/Interviews
Shephard, et al (1998)		Salaries and benefits of all staff	Quantity and price of each drug		Replacement cost and equivalent annual value	Replacement cost and equivalent annual value	
McCoy B.D, et al (1998)	Mount Frere (SA)	Mid-point of salary scale	Actual costs from drug depot plus 50% for transportation	<i>Recurrent:</i> Fuel expenditure plus 15 % to accommodate other costs	Actual cost of both recurrent and capital from the dept of Public Works	Actual cost from the Accounts and Stores offices	Mainly records
Govender, et al. (2000)	South Africa	Actual salaries and adjusted to cover benefits	Record forms for quantity and Community Health services Organisation prices	Not mentioned	CSIR estimates And equivalent annual cost	CSIR estimates And equivalent annual cost	Mainly records
Valli, A. et al (1991)	South Africa	Actual expenditure on staff	Actual expenditure with adjustment made for donated items	Replacement cost	Replacement cost	Replacement cost	Not mentioned

## **2.5. Allocation of costs to health services**

Cost centres to which the costs will be allocated have to be identified prior to allocation of costs from the cost centres have to be allocated to relevant services for example to outpatient or inpatients on the basis of allocation method chosen. For instance, catering costs can only be allocated to wards as it is used for inpatient care. The basis of cost allocation may vary subject to evaluator's choice and availability of information.

All costs incurred in the provision of services are allocated to relevant services based on methods suitable for each category.

### **2.5.1. Personnel costs**

The method of allocating costs differs according to researcher's choice. The most favourable method of allocating personnel costs is the time spent performing certain activities (Creese and Parker 1994). During data collection, staff are usually asked about how they distribute their time between different activities. Staff time can be used in the data analysis as the basis for allocating personnel costs.

### **2.5.2. Drugs and consumables**

Allocation of both drugs and consumable costs is subject to the quantities that were used for each service. The utilisation level of health services can affect the costs of both items. The higher the utilisation level, the more drugs and consumables are needed. Therefore, the proportions of patients can be used as the basis for allocating drug and consumables costs, taking into consideration that some diseases use more drugs than others.

### **2.5.3. Cost of capital inputs**

The annual value of the capital items such building, equipment and furniture is allocated to the relevant services on the basis chosen. Allocation of capital costs could be based on their usage. For instance, proportions of patients using particular capital items e.g. equipment can

be used to allocate costs. Square metres of different wards and outpatient department can also be used to allocate capital costs of buildings

#### **2.5.4. Overhead costs**

Costs of shared utilities are allocated to all relevant cost centres. The proportion of cost allocated to a particular section depends on the quantity of the utilities it has used (Drummond et al. 1986). The basis for allocating each type of costs to services has to be formed. For instance, the floor space may be used to allocate shared costs such as electricity, water and administration and the laundry weight for allocating the laundry costs.

Below is the summary of the cost allocation methods used in different studies.

**Table 2.2: Used methods of cost allocation**

Author	Study Site	Personnel	Drugs	Capital costs	Admin	Laundry & Kitchen	Consumables	Maintenance	Transport
Govender, et al, (2000)	S.A.	Staff time	N/A	N/A	According to % of total staff in med. wards	According to % of total staff in med. wards N/A	N/A	Floor space	N/A
Valli, A. (1991)	S.A.	1.Domestic worker Method: Floor space 2. Administration staff Method: No. of patients.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kirigia, et al (1998)	Kenya	N/A	Estimation of the actual use	N/A	Share of personnel cost	In patient days	Estimation of the actual use	N/A	N/A
Mills, et al (1993)	Malawi	Staff time	Estimation of the actual use	N/A	Direct cost of admin	Inpatient days by ward		Floor space	Logbooks (KM's)
Omar. et al (1995)	Uganda	N/A	Drug received by cost centre	N/A	Direct cost accumulated	In patient days	The actual cost of supplies	Direct cost accumulated	According to calls for transport

## 2.6. Essential health package

The rising costs of care and increasing burden of disease pose a major threat to developing countries with limited health care resources. However, it is impossible for many countries to provide health services that address all the population health needs. The Alma Ata declaration emphasizes health care provision which focuses on comprehensive primary health services that include promotive, rehabilitative, curative and preventive services (WHO 2003) Even though the comprehensive primary health services approach may be considered as cost-effective, and having wide coverage its scope could be too broad. Hence, countries, especially low-income countries with limited resources may find it unaffordable (WHO 2003) the public health sector, especially of developing countries often functions with very limited resources and provides health care for the majority of the population. Hence, the World Bank (WB) recommended an essential package of services which aims at promoting access to health care among vulnerable groups as well as minimising the cost of care (Bobadilla et al. 1994). The essential health package (EHP) emphasizes provision of low cost health services considered as capable of reducing the disease burden and consequently reducing health care costs.

The recommended package of essential services was based on the 1993 World Development Report (WDR) which aimed at assisting developing countries to improve their health through priority setting. The report provides estimates of the global burden of diseases (BoD) and cost-effective interventions capable of reducing the estimated burden. The BoD and cost-effective interventions were measured on the basis of DALY's lost and cost per DALY gained respectively and were used for priority setting. Interventions with low cost per DALY gained were regarded as cost-effective.

However, the WDR health package for developing countries received criticisms (Paalman et al. 1998; Wiseman and Mooney 1998; Mooney and Wiseman 200) based on the following points:

- Generalisation of the findings across the countries, using global burden of diseases (BoD) and their cost-effective interventions

- Use of international health indicators especially of the developed countries such as life expectancy and DALY's in assessing burden of diseases (BoD) and designing a package for developing countries
- Selection of limited health services hence encouraging vertical health programmes
- Exclusion of the patient, shared and fixed costs in cost calculations and so on

Generalisation of the findings across the countries is one of the major issues for which the WDR report was criticized. For instance, the use of global BoD and their cost-effective interventions raises some concerns in that countries face different epidemiological patterns and cost-effectiveness of an intervention in one country does not necessarily imply it would be the same in other countries. The disability adjusted life years (DALY's) used to assess the BoD were calculated from life expectancy of developed countries which increases high burden of diseases in developing countries with low life expectancy (Paalman et al. 1998).

The emphasis on reduction of diseases through use of BoD measures has been criticised on the basis that, it assumes that reduction of diseases is the only objective of health services and therefore disregards other expectations (Mooney and Wiseman 2000). Although this approach can lead to inefficient and inequitable resource allocation, it has the potential to produce benefits for those who bear the burden of diseases (Barker and Green 1996). For instance, some population groups such as the poor which carry a relatively higher BoD may benefit from this approach as it attempts to address their health needs.

In addition, the effectiveness of an intervention is subject to utilisation levels which therefore differ from country to country depending on the demand of such services. Hence, it may be considered invalid to generalise effectiveness of a particular service in one country to other countries. Additionally, the validity of the cost-effectiveness estimates in the WDR was questioned, as some costs were not included in the calculation of costs for example patient costs and some shared fixed costs.

The fact that the WB EHP emphasizes selection of services has implications for encouraging vertical health provision hence reducing the range coverage of health services (Paalman et al. 1998). Moreover the suggested services to be provided are based on global findings and are not country specific whereas the scope for essential services to be provided is usually influenced by the “disease profile, health expenditure per capita, infrastructure, and socio-economic conditions and policy framework” (Bobadilla and Cowley 1995).

The WB selected health services package includes maternal health, child health services, family planning and limited outpatient care (World Bank 1995). Detailed information on the services recommended for the basic package is presented on table 2.3.

**Table 2. 3.: World Bank recommended basic package**

<b>Basic package of health care inputs</b>	
Maternal and child health	Prenatal and delivery care, management of high risk pregnancies, postpartum care, well-baby services, family planning
Immunisation	Vaccinations, prevention of iron deficiency
Outpatient care	Diarrhea, TB, Malaria, measles, polio, respiratory infections, STD's, oral dehydration, urinary and gynaecological infections
Chronic care	Certain chronic illnesses
<b>Support services</b>	Information, education, and communication to improve screening and diagnostic accuracy, provider compliance, and patient compliance
<b>Intersectoral interventions</b>	Safe drinking and sanitation

The WB suggests that the selected services should be funded by the government and therefore available free to patients. However, patients with other health care needs beside the ones in the package have to pay for them from their pockets. The government-funded services are only those considered the most effective in dealing with health problems common to vulnerable population groups. The WB recommended basic package cost were estimated to be US\$13 for low income developing and about US\$16 for high-income developing countries (World Bank 1995).

Despite its costs, SA adopted a comprehensive primary health care (PHC) package including all health services. SA PHC services are provided through the District Health System (DHS) with clinics, community health centres and district hospitals (DH) forming the district health system (NDoH 2002). Unlike in the WB basic package in which the government funds only the selected services, the South African government funds all primary health services. Therefore PHC services are available at no charge to users at primary levels of care.

The key issue is whether SA can afford a comprehensive package of PHC and whether *the government provides adequate funds for the provision of the comprehensive package*. Attempts have been made to consider these issues. For instance, the Centre for Health Policy (CHP) in 1996 costed a sample of urban and rural PHC services, developed a recommended set of PHC services norms and modeled likely cost of a comprehensive package. The report provides guidelines for the proposed PHC services provision in SA in both rural and urban settings. It provides the estimated requirements of the PHC such as type and number of personnel required, type of facilities for different geographic areas and target utilization rates for each PHC service as well as cost of each service. Considering the CHP guidelines for PHC services, it is interesting to know whether the proposed package has been achieved.

The National Department of Health (NDoH) in 2000 updated the CHP costing of PHC services as well as using data from similar studies undertaken in the Eastern Cape and Free

State (Brijlal and Hensher 2000). The report aimed at assessing the current national costs of PHC package as well as identifying areas of concern. According to the NDoH estimates, expenditure per capita on PHC services in 2000 was about R173 for the total population. However, another evaluation of PHC funding study discovered that the national expenditure per capita in 2000 was about R130 for the population without medical aid cover and R143 for the total population (Okorafor et al. 2003). However, the SA government goal is to achieve R200 expenditure per capita at 3.5 visits per person per year by the year 2005. In this context, it is interesting to know the current costs of PHC services, especially rural PHC services.

The costing study in Manguzi sub-district hopes to provide some information on the cost of rural PHC services in SA and address some issues of efficiency around resource allocation.

## **2.7. Conclusion**

Costs analysis has been viewed to be important as it provides information on which decisions can be based. It is also important for health services managers to know whether health resources were used efficiently or not. Inefficient resource use is common in the health sector and that can be rectified by the availability of e cost data, as it shows what resources were used.

The review of literature has been useful in selecting appropriate methods to use in the data analysis of this study. Therefore, to some extent, the methods used in this study have been influenced by literature.

### **3. METHODOLOGY**

#### **3.1. Background**

A cost analysis study was conducted in KwaZulu-Natal in the Ingwavuma Health District. The cost data for one financial year 2000/1 were collected. As the study is interested in finding the costs of providing primary health care services in a rural setting, the Ingwavuma district was chosen, as it is a rural area. Ingwavuma health district has two district hospitals and nineteen clinics including mobile teams operating under both Manguzi and Mosvold hospitals. The costing of primary health care (PHC) services was undertaken at both clinic and hospital outpatient levels. The costs of providing PHC services at the two levels of care were compared. Comparisons between these two levels were based on the unit cost of each service. A further cost comparison of PHC services was done between Manguzi clinics, Agincourt clinic and Alexandra health centre (AHC). Data on these two sites, Agincourt and AHC was found from the study conducted by the Centre for Health Policy (CHP) in 1992.

Comparison of costs of health services provided at two levels of care was based on the unit cost and methods used are explained in the analysis section of this report. The cost comparisons of hospital and clinic PHC services were considered important as the district hospitals in KZN have a major role in the delivery of PHC services.

#### **3.2. Sampling**

Cost data were collected from Manguzi sub-district at one district hospital (Manguzi) and in nine clinics operating within this hospital catchment area. The facilities were selected to allow cost comparison between these two levels of care. Therefore, costs of providing PHC at these two levels of care were compared.

A sampling method was designed for data collection whereby relevant key informants were selected at each facility. To select a representative sample, from each personnel category a respondent was selected.

Unlike in the hospital whereby interviews were held with the person heading the department, at clinics, only a professional nurse managing the facility was interviewed. The total number of people who were interviewed in all the facilities was sixteen.

### **3.3. Data Collection**

#### **3.3.1. Hospital**

Interviews were done with the selected informants at each section. Questions for interviews focused on resources used in the provision of PHC services and questions were designed for each department. Therefore information covered in the questionnaire differed across departments and facility levels. For instance, at each department, the person heading was interviewed and these are administration, pharmacy, information office (statistics), finance and transport.

Below is the discussion on departments visited and type of information collected from department or facility.

In the nursing personnel working at the outpatient (OPD) section, a professional nurse in charge was interviewed. Data were collected through interviews and record reviews. Information on the process of handling patients visiting the facility was collected.

Patient statistics were collected from the statistics office and was presented in monthly reports which show the total headcount and number of patients per category of diseases. All the monthly statistics reports available for the year 2000 were collected. Due to inconsistencies in the statistics data with some of the months' data on some services missing, extrapolation and estimations had to be done for other months.

The interview with the hospital administrator focused on the personnel structure, that is, number of personnel employed, their positions and the source of the salaries.

In the finance department, Financial Management Services (FMS) reports were reviewed to get breakdown of expenditure. An expenditure report of each clinic was also obtained from the hospital.

In the pharmacy, the interview was around expenditure on drugs during the study period. Data on total expenditure on drugs was presented in monthly expenditure reports at the pharmacy including drugs sent to the clinics.

In the transport department, a list of vehicles that were in use during the study period was obtained. It was not only showing the number of vehicles but also the type of each vehicle. A logbook where the number of kilometres (KM) travelled by each vehicle were recorded was obtained. This has allowed calculation of vehicle running costs. {See method under valuation of inputs}

One person working in the Stores section was interviewed and records were reviewed to obtain the inventory list of hospital equipment and furniture.

The table below shows the hospital departments that were visited, the persons who were interviewed and the type of data collected.

**Table: 3.1: Hospital departments, interviewed person and the type of personnel data collected.**

Department	Interviewees	Type of data
Outpatient department	Prof. Nurse	Process of patient handling, working time and other activities staff perform
Finance	Person in charge of finances	Expenditure data
Administration	Hospital Administrator	Hospital personnel, staff number & categories, information on building size
Transport	Person in charge of transport	No. of vehicles, type, KM's travelled
Pharmacy	Pharmacist	Costs, type and quantities of drugs ordered
Patient statistics	Information officer	Total headcounts broken down by each category of disease
Stores	Stores Manager	Facility functioning equipment and furniture

### 3.3.2. Clinics

Unlike in hospital, data at clinics were collected from one person managing the facility. Some general issues around activities which staff are involved in were discussed.

Although some data were already provided from the interviews, some were obtained from the records. Reviewing records was found useful to supplement interviews and were used for data validation.

The table below shows the summary of the methods used in data collection from the clinics and hospital.

**Table 3.2: Summary of data collection methods**

<b>Clinic level</b>	<b>Source of data</b>
No. of staff and their duties	Person in charge of the clinic & Admin
Total PHC headcounts	Records
Expenditure (Capital & Recurrent)	Finance office of the hospital
Drugs	Pharmacy records of the hospital
Clinic space	Clinic plan or physical measurements
Equipment and furniture (list of available items)	Records/ physical count
Transport: -No. of cars & type, KM travelled by each car.	Records/interviews with the person in control
<b>Hospital level</b>	
No. of staff and their duties	Interviews with personnel officer and selected members of staff. (a list is on the previous page).
Total headcounts	Records
Expenditure (Capital & Recurrent)	Finance records
Drugs	Pharmacy records
Hospital building space (OPD)	Physical measurements/interviews
Equipment and furniture (list of available items)	Records/physical count
Transport: -No. of cars & type, KM travelled by each car.	Records

### 3.4. Valuation of costs

Costing of PHC services at a clinic differed from a hospital, in that analysis of costs at clinics was done for all nine clinics operating under Manguzi hospital combined and for individual clinics. Therefore, unless stated statistics and expenditure data presented in the study for the clinics represent all the nine clinics.

Both the total expenditure and the unit costs of each service at each level of care were calculated and a comparison of costs was made. The total costs of each category of diseases or services were calculated by allocating relevant costs to the services. The costs of these services provided at both clinic and hospital levels will be discussed in the results section of this report.

All inputs to be costed were separated according to the relevant categories, that is, recurrent and capital inputs.

#### **3.4.1. Recurrent items**

Recurrent costs of various items were measured using appropriate methods. A list of recurrent inputs costed is as follows:

- Salaries
- Administration
- Maintenance
- Drugs
- Consumables
- Utilities

Personnel costs were calculated using gross annual expenditure on salaries. This information was obtained from the person in control of finances and by reviewing finance management records. The report showed total expenditure on personnel paid by the Department of Health. The personnel costs included the actual salary plus fringe benefits such as housing, transport, medical scheme membership and other allowances staff received.

Data on drug costs were obtained from the pharmacy records. Monthly expenditure reports on all drugs for the whole study period i.e. 2000 were reviewed. Information on itemised drug code, price, quantity and expenditure was obtained from these records.

To calculate the recurrent cost of vehicles, the number of kilometres travelled per vehicle, was calculated. Automobile Association (AA) rates were used to calculate the recurrent cost,

which includes all vehicle running costs such as fuel and maintenance costs. The number of kilometres (KM) travelled was then multiplied by the AA rates for each type of vehicle.

Expenditure data on overhead items such as water, electricity, maintenance, administration and expenditure on miscellaneous items was found in the expenditure report and was allocated to relevant services based on the allocation methods discussed elsewhere in this paper.

### **3.4.2. Capital items**

For calculating the capital costs for building, vehicle, equipment and furniture, replacement value had to be obtained. Below are the examples of capital inputs costed.

Capital inputs:

- Buildings
- Vehicle
- Equipment
- Furniture

In calculating the capital cost of building, the size of the building was obtained from the building plans. In cases where there were no records kept for the size of a facility, measurements were taken physically. The construction technology company, CSIR was contacted to get the cost of building per square metre for both clinic and hospital buildings. The obtained value of building per square metre was multiplied by the total space of the whole facility to get the total replacement cost of the building. However, at the hospital, only the replacement cost of the OPD section was calculated as the study was interested in finding cost related to outpatient care.

The replacement cost for equipment, furniture and vehicles was calculated using the current market prices (Drummond et al. 1986). Furniture, equipment and car dealers were contacted and provided current purchasing prices of the items.

The amount obtained for each type of capital items was annualised to get the annual replacement cost. Buildings were assumed to have 30 years, furniture and equipment 10 years and vehicles 5 years of expected useful life span and were all annualised by 8% discount rate.

The table below shows a summary of the methods used in calculating costs of different items.

**Table 3.3: Methods used in costs calculation (hospital)**

<b>1.Capital items</b>	<b>Cost calculated</b>	<b>Method of valuation</b>
Buildings	OPD replacement value	Cost/square metre*total space
Equipment	Replacement value	Current market price of each item
Furniture	Replacement value	Current market price of each item
Vehicles	Replacement value	Current market price of each vehicle type
<b>2. Recurrent items</b>		
Personnel	Expenditure on personnel salaries & benefits	Actual expenditure on personnel salaries & benefits
Drugs	Cost of drugs	Actual cost of drugs
Consumables	Consumables cost	Actual cost of consumables
Administration	Administration cost	Total admin. costs
Maintenance	Maintenance cost	Total maintenance costs
Overheads, i.e. Electricity, water, admin	Expenditure on Overheads	Expenditure on Overheads from expenditure report
Other expenditure	All other expenditure	Total expenditure

### **3.5. Evaluating PHC services costs**

#### **3.5.1. Description of PHC services costed**

For both clinics and hospital levels of care, PHC services were classified into the following categories:

- Curative care services
- Sexually Transmitted Diseases (STD's)
- Chronic care services
- Child health services
- Notifiable diseases such as malaria and tuberculosis
- Child immunisation services
- Mental health services

The list of diseases falling in these categories is shown in the table below.

**Table 3.4: PHC services**

<i>Curative care</i>	Substance Abuse, Physical Abuse, Rape/Sexual Abuse, AIDS (Clinical), Diabetes Mellitus, Ear Nose And Throat, Gynaecological Conditions, Helminthiasis Under 5 Years, HIV Suspect, Motor Vehicle Accident, Ophthalmic Condition, Oral/Dental Condition, Skin Disease, Gun Shot, Other, Hypertension Case (Pregnancy Induced), Diabetes Mellitus Case (Pregnancy Induced)
STD's	All STD's, Male urethral discharge
Chronic Care	Arthritis, Asthma, Epilepsy, Hypertension, Neurological condition
<i>Child health care</i>	Diarrhoea, Malnutrition, Respiratory infections, Helminthiasis, Measles
<i>Notifiable diseases</i>	TB & Malaria
<i>Child immunisation</i>	Vaccination
<i>Mental health care</i>	Psychiatry cases

Curative care services mainly refer to adult curative care. Some curative care for children is grouped under child health care services. Category “other” under curative services includes all other PHC services not mentioned in the list.

Apart from male urethral discharge, all STD types were not specified. Like in STD services, mental health care category includes all psychiatric cases irrespective of the type of the problem.

For children, there are two service categories, child health care and immunisation services. The former is more curative care and the latter is more preventive care. Diseases categorised under child health care are predominantly children of less than five years old. It is stated in the statistics records if the child is under the age of five.

Tuberculosis and malaria were grouped separately as notifiable diseases. The reason for grouping these diseases under a separate category is that, they are known as having higher mortality than other diseases. According to World Health Organisation (WHO), diseases like malaria, TB and HIV/AIDS are regarded as "major killer diseases" in that they have high death rate compared to other diseases (<http://www.who.int/inf-fs/en/back001.html>) (12/09/2002). Though malaria only affects some people in some areas, it is recognised as a killer disease because of its high death rate in areas where it is endemic.

### **3.5.2. Allocation of costs to services**

The cost of providing each service was calculated through allocating the total costs of each cost category to the relevant health services. The amount of costs to be allocated to each service was based on the allocation method selected.

All recurrent costs including the overhead costs were allocated to relevant health services. Criteria for allocating all the costs to health services were chosen with proportions of patient being the most common method used in almost all categories except personnel and drug categories. The total number of visits for a specific service was divided by the total patient visits. The proportion obtained was used to allocate costs from most cost categories to health services. For example, in allocating costs to STD services, total number of visits for STD services was divided by the total facility visits. The same method was applied to all other services.

However, a different method for allocating the personnel costs was used. Instead of simply using the proportions of the patient numbers, utilisation weighted by staff time was used. The staff time used for weighted visits was obtained from the guidelines for PHC services in SA, developed by the Centre for Health Policy (CHP) in the Need/Norms study (Rispel et al. 1996). The estimated staff time for each category of PHC services was multiplied by the actual utilisation of a specific service to calculate weighted utilisation. Thereafter, the weighted utilisation figures were divided by the weighted total visits which was calculated by summing up utilisation of all services. The weighted proportions were used to allocate personnel costs.

Unlike in other categories of costs, allocation of drugs costs needed much attention. Firstly, the reports on drug expenditure only showed drug codes and the price next to each code. Those were then matched with the code in the drug catalogue to see the name of the drug. The catalogue showed the drug names as well as the dosage. Drugs were then classified according to the diseases for which they were used, using books on standard treatment guidelines and essential drug list. Classification of drugs was based on the categories of PHC services established. That allowed understanding the levels of drug consumption by each PHC category. As the child health care was one of the PHC categories set, it was difficult to identify medicines used for this category and therefore dosage was used to classify medicines used for child health care services.

Secondly, unlike other costs, drug costs collected were aggregated, i.e. combining hospital outpatient (OPD) and inpatient (IPD) drug costs as well as the costs of drugs sent to the clinics. Therefore the costs had to be first split between outpatient and inpatient care at hospital and then between hospital and clinic outpatients. As there was no data on OPD and IPD drug costs, assumptions had to be made to split the costs. For each service category, it was assumed that the costs of drug used at IPD are equivalent to OPD. This assumption was based on the fact that an outpatient will be given a full course of drugs to treat their illnesses, which may be very similar to the drugs dispensed to an inpatient. The total cost of drugs of a particular category was divided by the number of admissions *plus* total outpatient

visits of that specific service (hospital and clinic OP visits). That gives cost of drugs per patient and that was multiplied by the number of outpatient visits to get total drug costs of OPD and by the number of admissions for IPD drug costs. However to split the outpatient drug costs between hospital and clinics, total number of outpatient visits at each level was multiplied by cost of drug per outpatient.

An alternative assumption used, as sensitivity analysis was that cost of drugs is twice as high for IPD as OPD. This assumption was based on the fact that an outpatient's course of drugs, which may be less expensive than the drugs dispensed to an inpatient. Again, the total drug costs for a particular service was divided by the number of OPD visits *plus* number of admissions multiplied by two. The answer was multiplied by the number of outpatient visits and admissions for OPD and IPD drug costs respectively. Again, a further split between outpatient drug costs at hospital and clinics was done using outpatient visits at both levels.

A slightly different method was used to split costs of drugs for child immunisation. The fact that immunisation services are available for outpatients only simplified splitting immunisation vaccine costs between outpatients at clinic and hospital. Proportions of patients at each level of care were used to split immunisation costs.

**Table 3.5: Summary of the cost allocation methods**

<b>Costs</b>	<b>Method of Allocation</b>
Personnel	Total expenditure on personnel * % Weighted visits
Drugs	Direct ( <i>drug costs of each PHC service were calculated and allocated directly to relevant services</i> )
Administration	Administration * Proportion of patients
Transport	Annual recurrent cost * Proportion of patients
Maintenance	Maintenance cost * Proportion of patients
Furniture	Annual recurrent cost * Proportion of patients
Equipment	Annual recurrent cost * Proportion of patients
Medical consumables	Administration cost * Proportion of patients
Buildings	Annual recurrent cost * Proportion of patients
Other expenditure	Other expenditure * Proportion of patients
Utilities	Total expenditure on utilities * Proportion of patients

### **3.5.3. Unit cost per service**

The unit cost for each service category was calculated at both health care levels. For example, the unit cost for the curative care services was calculated by dividing total expenditure on curative services by the number of curative cases.

### **3.5.4. PHC services costing**

Costing of PHC in Manguzi health district was done in two ways. First, a full costing was conducted taking into consideration both recurrent and capital costs. Second, the analysis excluded capital cost. This was mainly done to assess the contribution of the capital costs to the total expenditure. Some differences in terms of costs between the clinic and hospital level are likely to be influenced by the capital costs.

Comparison between services provided from different facilities was based on the unit cost. The unit cost for each service at each level of care had to be calculated to allow comparison of costs between clinics and hospital levels.

### **3.5.5. Comparison between the KZN results and the CHP PHC costing studies**

In the PHC costing study done by CHP in 1992, five sites were included. However, for comparison of the KZN and CHP results, only two sites from the five were chosen and these are Agincourt and Alexandra Health Centre (AHC). The choice of study site for comparison was based on characteristics of these facilities. Agincourt was chosen because it shares some similarities with Manguzi in the sense that, both are rural while AHC is located in an urban setting, hence allow comparison of different settings, i.e. rural *versus* urban.

However, not all the PHC services costed by the two separate studies were comparable. Four services were selected for comparison, namely, curative care, chronic care, STD's, and child health services. When comparing the results of the two studies the unit costs were used. The unit costs of the two sites, Agincourt and AHC were compared with the facilities of

the same level in KZN. As the CHP study was conducted about eight years ago, i.e. 1992, prices were inflated using the inflation rate of each financial year. The costs of the 1992 study were inflated up to 2000/01. {See appendix1 with inflation factors}. All the costs discussed in this paper are real prices with inflation rate having been considered

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## **4. RESULTS AND DISCUSSION**

### **4.1. Introduction**

This chapter discusses results of the costing of Primary Health Care (PHC) services in KwaZulu-Natal (KZN). This chapter is divided into various sections, namely, utilisation and expenditure of the health facilities, unit costs of PHC services at clinic and hospital levels of care, line item unit costs, efficiency and staff workload analysis, comparison of the unit costs with other studies conducted over different periods of time and finally, analysis and discussion on scaling up to the essential PHC package of South Africa. The comparison of different studies section compares the results of the KZN study with those of the study conducted by the Centre for Health Policy (CHP) in 1996.

Another important issue to note is that clinic level data is combined expenditure for the nine clinics. There are some instances where the findings are presented for individual clinics.

### **4.2. Key findings on utilisation and expenditure**

#### **4.2.1. Utilisation**

The level of service utilisation can be influenced by a variety of factors, including patient perceived quality of care, access to care in terms of distance, the size of the population and so forth. The table below shows the levels of utilisation among different PHC services at both hospital and clinic levels of care.

**Table: 4.1: Utilisation of PHC services at clinic level (9 clinics & a district hospital in Ingwavuma health district)**

PHC category	Clinic Utilisation (9 clinics)		Hospital Utilisation (1 hospital)	
	No. of cases	% of total	No. of outpatient cases	% of total
Curative care	57,514	43.2	30,411	67
STD's	5,063	4.3	2,160	4.7
Chronic care	10,391	7.5	3,409	7.5
Child health	32,008	24	6,064	13.3
Malaria	12,825	12.2	1,170	2.6
TB	249	0.2	298	0.7
Immunisation	9,058	8	2,405	5.3
Mental health	839	0.7	159	0.3
<b>Total</b>	<b>133,209</b>		<b>45,726</b>	

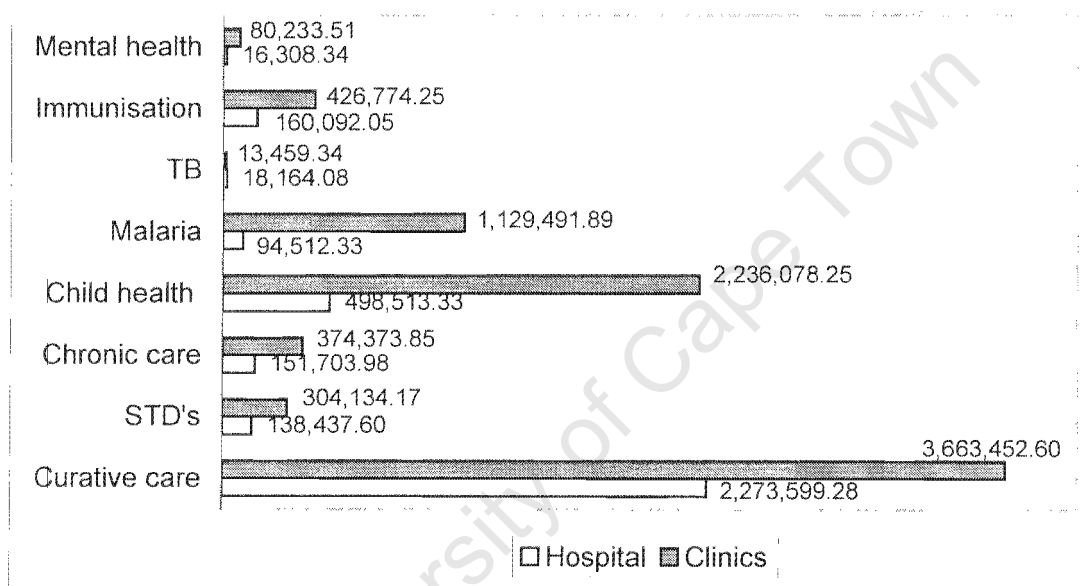
According to the information presented in table 4.1. curative services are the most utilised services at both clinics and the hospital, followed by child health services. This clearly, shows that outpatient services have a tendency to focus on curative care.

#### **4.2.2. Expenditure on PHC services in Manguzi health facilities**

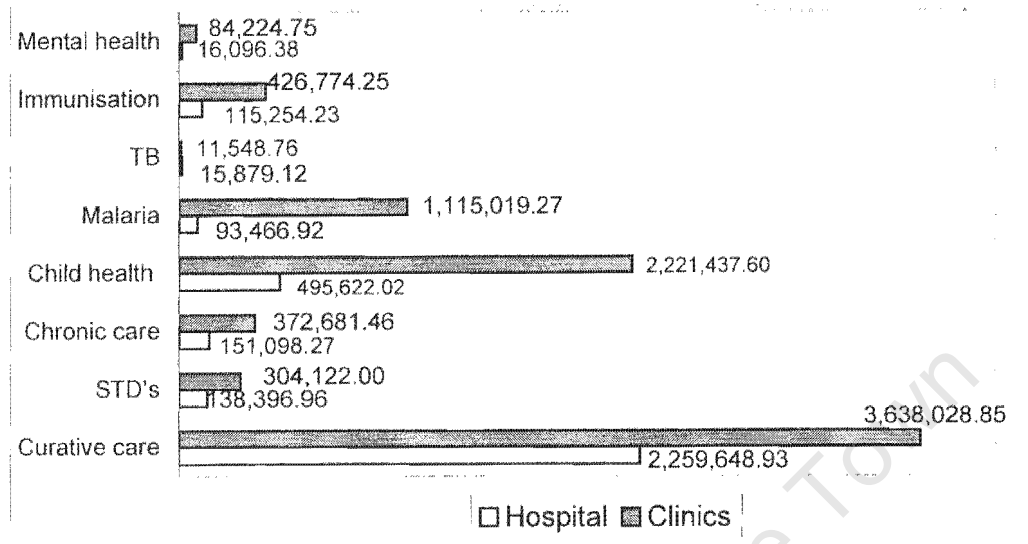
The overall expenditure on health services at clinic and hospital levels of care differ with the clinics having higher levels of expenditure on all services. In the South African health system, clinics are used as the first point of contact where most PHC cases are dealt with. Mostly, hospitals receive patients who are referred by the clinics. Therefore, it is expected that clinics will have a higher expenditure on PHC than a hospital, though they generally provide PHC services at a lower unit cost.

The graphs below show expenditure on PHC services provided at clinic and hospital levels. Graph 4. 1 shows the results when the drug cost for the inpatient and outpatient departments is assumed to be equivalent and 4.2. shows the results when it is assumed that the cost of drugs for an inpatient is twice as high as for an outpatient.

**Graph 4. 1: Clinic and hospital expenditure on outpatient services (2000/1) (ZAR)**  
 (Assuming drug expenditure per OPD visit =per inpatient admission)



**Graph 4.2: Clinic and hospital expenditure on outpatient services (2000/1) (ZAR)**  
 (Assuming drug expenditure per inpatient visit =twice as high as OPD visit)



As presented in the graphs, expenditure findings based on the two assumptions are similar. Clinics do not provide inpatient services. Certain services, such as such as immunisations, which are only provided on an outpatient basis, have no change in costs between the two scenarios. For other services, the change in cost is entirely due to the change in assumption about the cost of drugs.

Presentation of expenditure data for the services provided at clinic and hospital level was done in two ways, namely, based on total recurrent and capital expenditure and with capital costs excluded. The adjustments were made to evaluate the extent to which capital costs contributed to the total expenditure. When the capital costs were included, the total expenditure for the nine clinics was R8, 173,836.94 and for the hospital it was R3, 285,462.83. Total recurrent expenditure only at clinics was R7, 305,499.37, and R3, 016,797.20 for the hospital. Both the hospital and clinic expenditure seem not to have been

affected much by the exclusion of the capital costs. The difference is about R1million at clinics, whereas the hospital has a small difference of about three hundred thousand.

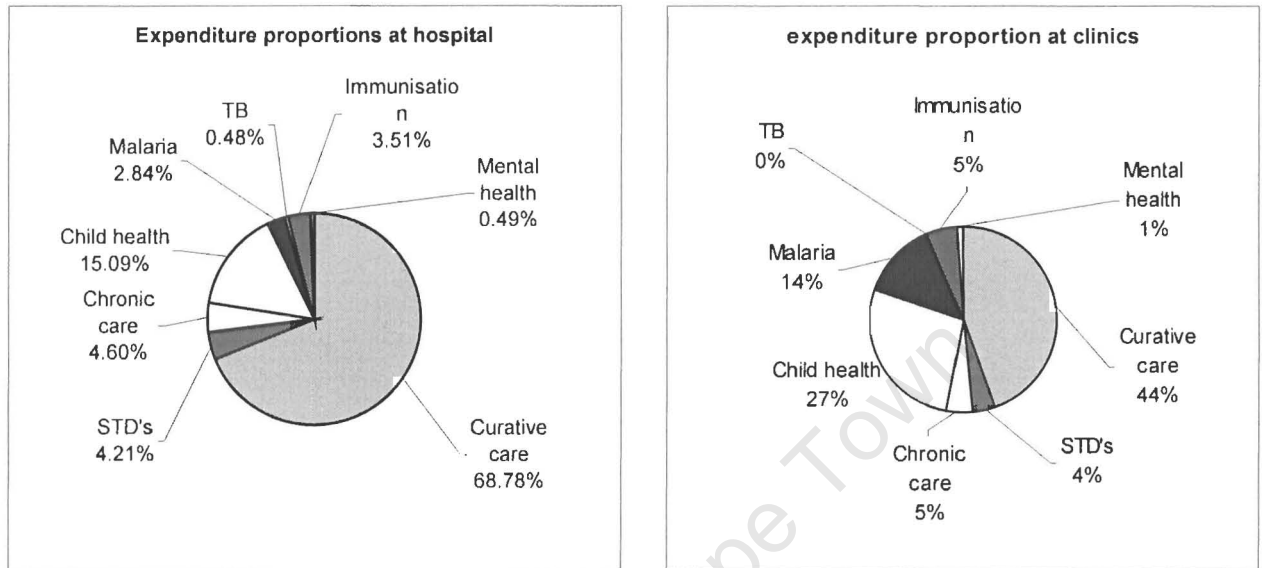
#### **4.2.3. Breakdown of expenditure by type of service**

The proportions of expenditure on particular types of PHC services were also calculated. Although the clinics provide considerable preventive services, the largest part of clinic resources is spent on curative care. Almost half of the total expenditure at the clinics was on general curative services.

The following graphs show the distribution of expenditure between different services.

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**Graph 4.3: Breakdown of expenditure by PHC service category at both clinic and hospital levels (2000/1) (ZAR)**



As shown in graph 4.3, general curative services at clinic level consume about 44% of total expenditure. The expenditure proportions on TB and mental health services are the lowest of all other categories of diseases. Even the utilisation rate of these two categories of services is lower and that may suggest relatively less need for these services. However, mental health problems are often under-recognised.

The expenditure on child health (children < 5 years) at Manguzi clinics is much higher than expenditure on health care for children under 5 years in the Halley Stott Health Centre (HSHC) and Umbumbulu clinic (UC) in KZN which were 7% and 11% of total expenditure respectively in 1997 (Jinabhai *et al.*, 1997). Approximately 27% of resources were spent on child health services in Manguzi clinics.

Similar to clinics, the hospital spent relatively large quantities of resources on curative care services, amounting to approximately two thirds of hospital outpatient resources. Child health services also took up a relatively high proportion of expenditure.

It is now useful to combine the data on utilisation and total expenditure in order to consider the cost per outpatient for each service at each level of care.

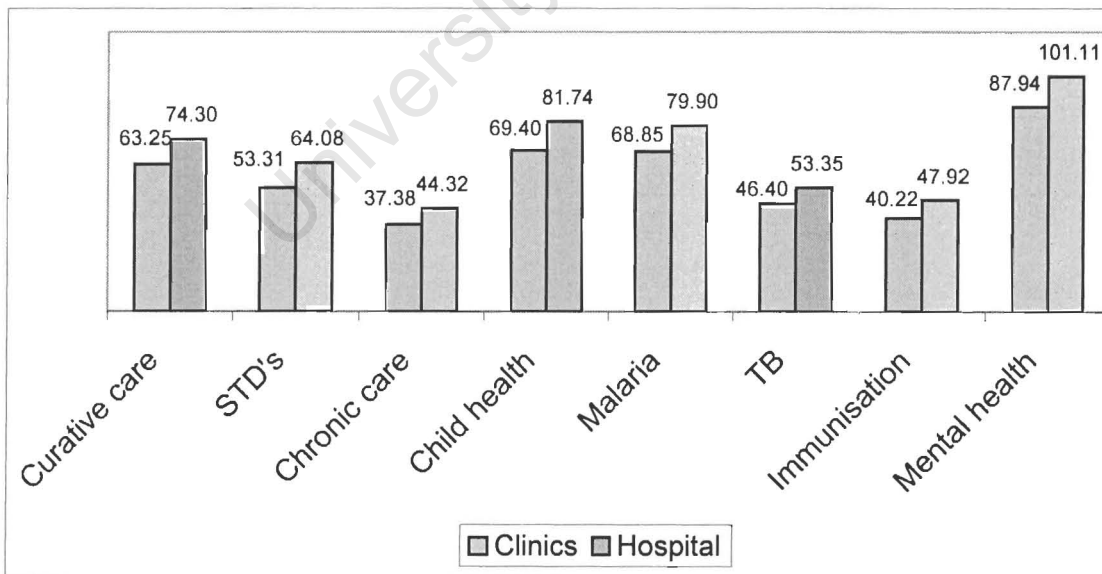
### 4.3. Unit Costs of PHC services

#### 4.3.1. Unit Costs based on total costs

Variations in the unit cost were discovered within individual facilities and between the two levels of care. Based on the unit cost, some services were found to be relatively more costly than others.

Graph 4.4 shows the unit cost of PHC services at clinic and hospital levels.

**Graph 4.4: Cost per outpatient at clinic and hospital levels (2000/1) (ZAR)**



Both the hospital and clinic levels appear to have followed a similar trend in the unit cost of services. For instance, services which were found to have relatively high costs at one level would also have high costs at another level. For example, mental health care, child health, malaria and curative care are shown as the most expensive services compared to other services at hospital level, with unit costs of above R70. Similarly, at clinic level the unit costs exceeded R60. However, although mental health services have the highest unit cost at both clinic and hospital levels of care, these services have relatively low overall expenditure. The costs of mental health services can be explained by the fact that, they require a considerably personnel time. Moreover, personnel is the largest cost category and that therefore implies that, services which require a relatively high proportion of personnel time are likely to be expensive.

In contrast, STD, TB, chronic care and immunisation services have relatively low unit costs at both hospital and clinic levels. The low cost of chronic illness care could be associated with its management, which is less time consuming. For TB and chronic health problems, once patients have been diagnosed, the following visits are for minor examinations and dispensing of medicines. Like chronic illnesses, immunisations can be easily managed, as the type of vaccines needed at each visit are known and therefore, their administration requires less time. Another justification for the low cost of these services could be their cost of medicines (See table 4.3).

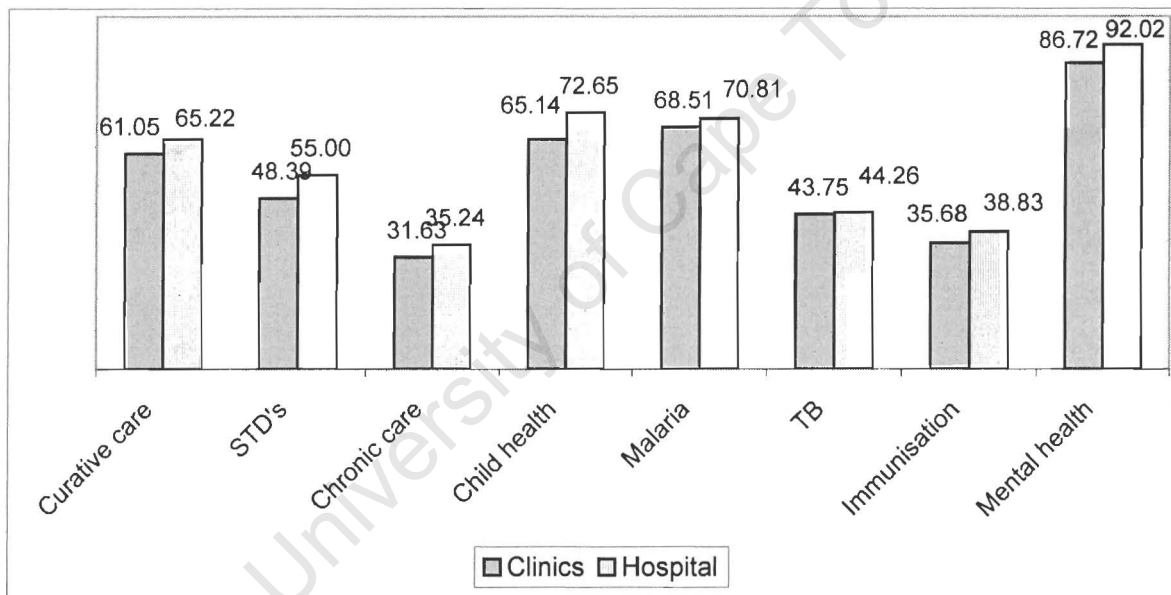
Compared to child health services, immunisation services, which are mainly curative care, have lower costs than child health care. In reality, preventive care is often expected to have lower costs than curative care.

#### **4.3.2. Unit costs based on recurrent costs**

The results of the preceding cost analysis indicated that the costs of health care provided at different levels vary. It is expected that provision of services at a higher level of care will be more costly owing to the type of resources being used, such as relatively highly skilled

personnel and some sophisticated equipment. Further analysis, which excludes capital costs, was done to assess the influence of the capital costs on overall costs. However, differences in the unit cost of services including and excluding capital costs were found to be minimal. (Compare graphs 4.4 and 4.5).

**Graph 4.5: Hospital and clinic cost/outpatient (excluding capital costs) (2000/1) (ZAR)**



As in the previous analysis of the total costs, TB, chronic care and immunisation services have the lowest unit cost at both levels of care. On the other hand, mental health care appears to have the highest unit cost, exceeding even that of curative services, which is often expected to be high at the hospital level as it covers a wide range of diseases.

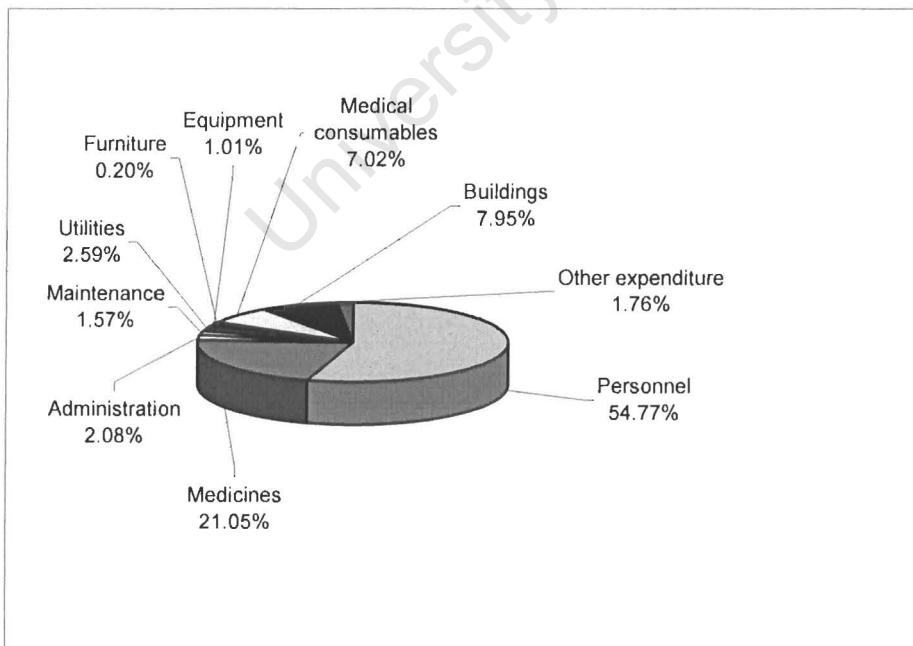
#### 4.4. Line item costs

##### 4.4.1. Proportions of each line item to total costs

An evaluation of the extent to which each line item contributes to total costs was conducted.

The line items include administration, transport, personnel, medicines, utilities, maintenance, consumables, furniture, equipment and other cost items. The aim of evaluating the line item costs was to understand how these items contribute to overall facility expenditure. The main interest was that of the major cost categories such as personnel and drugs (Gilson and Hanson 1993). Previous studies have found that these two cost categories have relatively higher costs than others (Jinabhai *et al.* 1997). From this type of analysis it could be possible to find ways of reducing costs through efficient use of resources.

Graph 4.6: (a) Breakdown by line items (clinics) (2000/1) (ZAR)

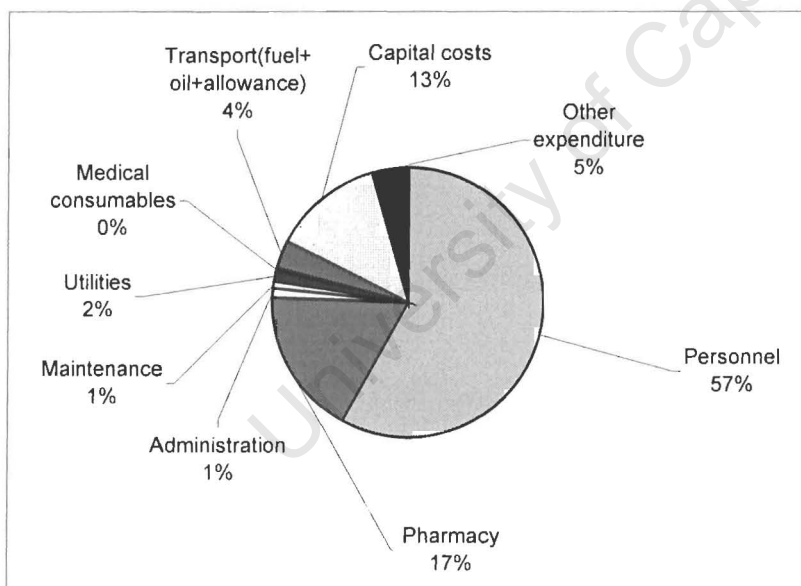


Personnel has the highest expenditure proportion of about 55%, followed by medicines. The proportion of expenditure devoted to personnel at Manguzi clinics are not as high as found in the national health accounts (NHA) study whereby personnel was found to have consumed above 60% of the total expenditure (Thomas and Muirhead 2000).

By looking at graph 4.6(a) it is obvious that building cost is one of the largest components of capital costs. This means there is high expenditure on building infrastructure.

Graph 4.6(b) illustrates how costs are distributed at the hospital.

**Graph 4.6: (b) Breakdown of expenditure by line items (Hospital) (2000/1) (ZAR)**



Approximately 57% of the hospital budget was spent on personnel. The findings of the hospital cost distribution are consistent with the results of previous studies. Most of the

costing studies found personnel to be the largest cost component (Flessa 1998; Kirigia *et al.* 1998; Green *et al.* 2001). Personnel costs are followed by medicines costs.

Beside the evaluation of the distribution of expenditure between line items, another investigation was undertaken to assess the unit cost per line item.

#### 4.4.2. Unit cost analysis

An analysis of the unit cost by line item was done for all nine clinics and the hospital.

As illustrated in the table below, the hospital was found to have a relatively high unit cost for personnel, medicines, capital and consumables. The unit cost at the hospital ranged from R0.06 to R41.17, with personnel having by far the highest unit cost.

**Table 4. 2: Overall line item unit cost at hospital and clinics (2000/1) (ZAR)**

Line items	Hospital	for nine clinics
Personnel	41.17	33.67
Administration	0.79	1.28
Medicines	12.48	12.83
Consumables	0.08	4.31
Maintenance	0.51	0.97
Other Recurrent Exp.	3.24	1.08
Utilities	1.11	1.59
Capital exp.	9.09	4.89
Equipment (Minor)	0.21	0.74
Kitchen	0.06	
Laundry	0.07	
<b>Total</b>	<b>68.72</b>	<b>61.36</b>

A comparison of the line item unit cost was done between the hospital and the nine clinics combined. The unit costs of the two levels of care differ considerably except in medicines, which have similar unit costs at both levels. The overall unit cost at the two levels was R68.72 and R61.36, with the hospital having a higher unit cost. Clearly, the differences in the overall unit cost at clinic and hospital levels were influenced by the personnel costs.

#### **4.4.3. Proportions and unit costs of the line items by services**

It is also important to conduct an analysis of the unit costs and proportions of line items by service categories. Variations in the proportions and unit costs of the line items between services at both the hospital and the clinics were discovered, with personnel having considerably higher costs than other line items (See table 4.3). Those services, such as mental health and child health services, which require considerably more staff time, have a relatively higher unit cost. Curative, STD and malaria services have similar personnel unit cost, as the three services require a similar amount of staff time. TB and chronic services, which require relatively less staff time, have the lowest unit cost.

Some differences in the unit cost of medicines were also discovered with some services having a relatively higher unit cost of medicines.

The hospital findings of the proportions and unit cost analysis appear to have followed a similar trend compared to clinics. The cost of medicines is similar to that in the clinics because of the method used in splitting the outpatient medicines between hospital and clinics. Like clinics where medicines were the second largest line item terms of the unit cost, the hospital also followed the same trend.

Considering the overall line item unit cost of each service, it is obvious that personnel is the key driver of the cost of services. Services, which were identified as having a relatively high unit cost of personnel, have a high overall unit cost. For example, curative, child health services, malaria and mental health services have a relatively high unit cost of personnel as well as overall unit cost.

Table 4.3: Proportions and unit cost of services by line items. (%'s are in bold) (2000/1) (ZAR)

Clinics	Curative care	STD	Chronic care	Child Health services	TB	Malaria	Immunisation	Mental health
Personnel	34.81	34.81	16.58	40.52	16.58	34.81	19.89	44.21
	<b>0.55</b>	<b>0.65</b>	<b>0.44</b>	<b>0.58</b>	<b>0.36</b>	<b>0.51</b>	<b>0.49</b>	<b>0.50</b>
Pharmacy	13.58	3.63	5.93	14.01	14.96	19.17	5.46	28.87
	<b>0.21</b>	<b>0.07</b>	<b>0.16</b>	<b>0.20</b>	<b>0.32</b>	<b>0.28</b>	<b>0.14</b>	<b>0.33</b>
Other recurrent	9.24	9.24	9.24	9.24	9.24	9.24	9.24	9.24
	<b>0.15</b>	<b>0.17</b>	<b>0.25</b>	<b>0.13</b>	<b>0.20</b>	<b>0.13</b>	<b>0.23</b>	<b>0.11</b>
Capital costs	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63
	<b>0.09</b>	<b>0.11</b>	<b>0.15</b>	<b>0.08</b>	<b>0.12</b>	<b>0.08</b>	<b>0.14</b>	<b>0.06</b>
<b>Total</b>	<b>63.25</b>	<b>53.31</b>	<b>37.38</b>	<b>69.40</b>	<b>46.40</b>	<b>68.85</b>	<b>40.22</b>	<b>87.94</b>
<b>8,173,836.94</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
<b>Hospital</b>								
Personnel	42.65	42.65	20.31	49.64	20.31	42.65	24.37	54.16
	<b>0.57</b>	<b>0.67</b>	<b>0.35</b>	<b>0.61</b>	<b>0.35</b>	<b>0.53</b>	<b>0.51</b>	<b>0.54</b>
Pharmacy	13.58	3.63	20.31	14.01	20.31	19.17	5.46	28.87
	<b>0.18</b>	<b>0.06</b>	<b>0.35</b>	<b>0.17</b>	<b>0.35</b>	<b>0.24</b>	<b>0.11</b>	<b>0.29</b>
Other recurrent costs	8.99	8.72	8.99	8.99	8.99	8.99	8.99	8.99
	<b>0.12</b>	<b>0.14</b>	<b>0.15</b>	<b>0.11</b>	<b>0.15</b>	<b>0.11</b>	<b>0.19</b>	<b>0.09</b>
Capital costs	9.09	9.09	9.09	9.09	9.09	9.09	9.09	9.09
	<b>0.12</b>	<b>0.14</b>	<b>0.15</b>	<b>0.11</b>	<b>0.15</b>	<b>0.11</b>	<b>0.19</b>	<b>0.09</b>
<b>Total</b>	<b>74.30</b>	<b>64.08</b>	<b>58.70</b>	<b>81.74</b>	<b>58.70</b>	<b>79.90</b>	<b>47.92</b>	<b>101.11</b>
	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>

The high unit cost of mental health care can be explained by its high unit cost of personnel and drugs. For instance, the treatment of mental health patients requires a reasonable amount of personnel time. There is also relatively low utilisation of mental health services. In most situations, health care services are not only provided at government facilities, but other service providers are likely to be available to provide certain health services. The availability of alternative service providers, such as non-governmental organisations (NGO's), community based organisations (CBO's), private providers and traditional healers within the community could have influenced the utilisation level of the facilities selected for the study in Manguzi. When there are other options available, the choice of services to use is usually based on quality of care received and accessibility of the services in terms of distance. In this case it is difficult to speculate whether mental health services provided in the selected facilities is perceived to be of high quality or not as the study did not explore quality of care issues. However, as a rural district, it is likely that a certain proportion of the population seeks health care from traditional healers. A considerable proportion of the African population uses the services of traditional healers (Kale 1995). The use of traditional medicines by certain groups is linked with their belief in supernatural powers. Mental health is among the diseases which are believed to have links with supernatural powers. Moreover, the use of traditional healing may delay the early diagnosis and treatment of the mental illnesses which could have been treated with less expensive drugs.

Further analysis of unit costs was done for individual clinics and was found to have followed a similar trend. At all nine clinics, personnel unit cost was the highest followed by medicines and capital costs. The findings of the analysis are presented in Table 4.4.

Table 4.4: Overall unit cost by line item for individual clinics (2000/1) (ZAR)

Clinics	Bhekabantu	Mshudu	Mvelabusha	KwaNdaba	PhelaNdaba	Thengane	KwaZibi	Zamazama	Mahlungulu
Personnel	21.90	43.26	36.99	33.33	29.95	23.98	40.16	42.74	40.69
Administration	1.15	1.41	1.57	1.15	1.02	1.02	1.76	1.54	1.48
Medicines	13.75	12.06	12.50	13.57	12.95	12.32	12.31	13.37	11.91
Consumables	7.34	4.97	6.91	4.64	2.22	2.75	6.29	3.59	3.92
Maintenance	1.39	0.98	1.52	0.70	1.04	0.50	1.47	0.94	0.75
Other Recurrent Exp.	0.07	0.18	0.09	0.22	0.11	0.02	0.15	0.09	0.07
Utilities	4.12	1.84	1.95	2.58	0.52	0.37	3.91	0.85	0.16
Building	5.26	8.53	10.36	4.70	3.56	4.77	9.88	5.33	5.84
Furniture & Equipment	1.26	1.63	2.20	1.00	0.75	1.01	2.10	1.13	1.24
	<b>56.24</b>	<b>74.87</b>	<b>74.09</b>	<b>61.88</b>	<b>52.13</b>	<b>46.75</b>	<b>78.02</b>	<b>69.57</b>	<b>66.06</b>

Between the clinics, some differences in terms of the unit cost of the line items were found. Such differences were not only on the line items, but on overall unit costs as well. For instance, the overall unit cost ranged from R46.75 to R78.02. Personnel was found to be the major contributor to variations in the overall cost. For example, clinics with high overall unit costs, namely KwaZibi, Mshudu and Mvelabusha also had relatively higher personnel unit costs. Moreover, Thengane, Phelandaba and Bhekabantu clinics, which were found to have relatively low overall unit costs, had low personnel unit costs compared to others. It was noted that clinics which had higher overall and personnel unit costs also had high capital unit costs. However, the unit cost of medicines was found to be relatively similar in all nine clinics largely owing to the allocation method used. The questions that arise from the findings are the following: *“Are the clinics with high unit costs simply better resourced than others? Or are the clinics with low unit costs more efficient than those with relatively higher costs?”*

As personnel was found to be the major contributor to overall costs, it was considered important to know whether these facilities had efficient staff allocation. Therefore, a further analysis was done to assess staffing levels as well as staff workload. The average number of patients a nurse sees per year was calculated by dividing the total number of patients by the number of professional nurses at each clinic (See table 4.5). Professional nurses were chosen because they are the ones doing most of the clinical work. Other categories of nurses mainly perform patient preparation activities.

**Table 4.5: Patient visit per professional nurse in 2000**

	Actual utilisation	Actual No. of Professional nurses	Total No. of nurses	Actual visits p/prof.nurse/year
Bhekabantu	14,426	3	5	4,809
KwaNdaba	18,187	3	5	6,062
KwaZibi	8,644	2	3	4,322
Mahlungu	14,624	3	5	4,875
Mshudu	11,140	3	4	3,713
Mvelabusha	8,247	2	3	4,124
Phelandaba	24,005	3	5	8,002
Thengane	17,900	2	3	8,950
ZamaZama	16,036	3	6	5,345
<b>Total: all clinics</b>	<b>133,209</b>			

Considering the information presented above, it seems there are some inequities and inefficiencies in terms of staff allocation. Though clinics have different utilisation levels, they have a similar number of staff. For example, Phelandaba clinic, which had the highest utilisation, has a similar number of staff compared to other clinics which are not highly utilised, e.g. Mshudu, Bhekabantu and Mahlungulu clinics. Moreover, Zamazama had in total the highest number of staff whereas its utilisation is less than that of Phelandaba clinic. Similarly, Thengane clinic is among the most highly utilised clinics but has a small number of staff in relation to less utilised clinics. These findings, therefore, suggest that the allocation of staff between these clinics was not based on staffing needs, which is often expressed in utilisation levels. Hence, staff in some facilities see relatively few patients. Therefore, further investigation is needed to determine *whether clinics with low utilisation and relatively fewer number of visits per nurse are being under-utilised or whether staff in clinics with a high number of visits per nurse are overextended.*

To explore this, the total number of visits for each service was multiplied by the average staff time required for each service. The total utilisation weighted by consultation time at each clinic is shown on the table below.

**Table 4.6: Total utilisation weighted by consultation time**

Clinics	Weighted utilisation
Bhekabantu	131,852
KwaNdaba	169,321
KwaZibi	77,231
Mahlungu	129,099
Mshudu	101,574
Mvelabusha	77,405
Phelandaba	222,978
Thengane	164,848
ZamaZama	147,543
<b>Total</b>	<b>1,221,852</b>

To assess staffing adequacy in each clinic to cope with the above patient load, the actual time available for patient consultation in a year per clinical staff member was calculated. From fifty-two weeks of the year, six weeks were subtracted for annual and sick leave. As the aim was to find the actual time available for patient consultation in a year, administration and time for lunch and tea breaks was subtracted from the average week of 40 hours. According to information provided in interviews with nurses, it takes an average of one hour a day to do administration, an hour for lunch and thirty minutes for the two tea breaks. Therefore, forty-six weeks were multiplied by twenty-seven and a half hours, which is the time a nurse has in a week for patient consultation, multiplied by sixty minutes. Therefore, each nurse has 75,900 minutes for patient consultation per annum. In order to know the required staffing level, the total time required to see patients at each clinic in a year (as reflected in table 4.6) was divided by 75,900 minutes.

Table 4.7 below shows the current staffing at each clinic and number of required staff calculated using the method described above.

**Table 4.7: Staffing at clinic facilities in 2000**

Clinics	Actual No. of Professional nurses	Total No. of nurses	Required professional nurses	Difference between actual & required professional nurses
Bhekabantu	3	5	2	1
KwaNdaba	3	5	2	1
KwaZibi	2	3	1	1
Mahlungu	3	5	2	1
Mshudu	3	4	1	2
Mvelabusha	2	3	1	1
Phelandaba	3	5	3	0
Thengane	2	3	2	0
ZamaZama	3	6	2	1
<b>Total</b>	<b>24</b>	<b>39</b>	<b>16</b>	<b>8</b>

The findings shown in the table above have some efficiency and equity implications in terms of resource utilisation. It was found that all the clinic facilities function with excess staff except Phelandaba and Thengani clinics, which were shown to have relatively high utilisation levels and more visits per nurse.

Therefore, Phelandaba and Thengane clinics were found to be the only ones that are efficient in terms of staff utilisation. All other clinics were found to have exceeded the required number of staff by one, except Mshudu clinic, which has an excess of about two professional nurses. This indicates the relative lower level of efficiency at this clinic. From an

equity perspective, if clinics are relatively well resourced, staff should be more evenly distributed between clinics. Particularly, one professional nurse has to be moved from Mshudu clinic to Phelandaba clinic.

The above analyses still leave some unanswered questions. *Are the clinics which require relatively fewer staff than they are currently employing being under-utilised, or do they serve low population areas?* An investigation was done on the population of the areas which these clinics serve. The total number of patient visits at each clinic was divided by the total population of the catchment area. The idea was to get an annual average number of visits per person living nearby these facilities.

**Table 4.8. Average utilisation per person per annum in each clinic catchment area**

<b>Facilities</b>	<b>Total</b>	<b>Population of the catchment area</b>	<b>Average visit/person/annum</b>
Bhekabantu	14,426	3,557	4.06
KwaNdaba	18,187	7,094	2.56
KwaZibi	8,644	9,759	0.89
Mahlungu	14,624	5,120	2.86
Mshudu	11,140	7,985	1.40
Mvelabusha	8,247	4,075	2.02
Phelandaba	24,005	10,302	2.33
Thengane	17,900	5,733	3.12
ZamaZama	16,036	6,117	2.62
<b>Total: all clinics</b>	<b>133,209</b>	<b>59,742</b>	<b>2.23</b>

Some differences in terms of the average visits per person per year in the clinics were discovered, with some clinics having relatively higher average visits per person per year. The average visits per person per year in these clinics range between 0.9 and 4.06, with KwaZibi having the lowest and Bhekabantu the highest utilisation.

When looking at the population of the catchment areas, KwaZibi and Mshudu clinics serve relatively high population areas but have low average expected visits per person per year. However, Thengani and Bhekabantu clinics serve relatively low population areas but have high utilisation as well as high average visits per person per year.

The fact that Manguzi health facilities are all located within 5 km distance of the catchment population suggests that distance cannot be linked with the variations in utilisation. Among factors which can possibly be linked with the variations is the actual and/or perceived quality of care provided at the facilities. Because of the quality of care, patients may not be willing to use services provided at one clinic and might prefer to seek health care from other facilities perceived to be providing better quality of care. For instance, the low average visits per person per annum of 0.9 in KwaZibi clinic suggest that there may be some problems of perceived poor quality of care in this clinic. It is possible that people will be visiting other facilities in the nearby communities for health care.

It was noticed that clinics, which have high average visits per person, have relatively low unit cost and high staff workload. Moreover, those with relatively low average visits per person, namely KwaZibi, Mvelabusha and Mshudu clinics, have high unit cost and low staff workload. This clearly suggests some inefficiency and maldistribution of resources in health care between some clinics.

#### **4.5. Conclusions**

Findings of this analysis show some differences in both expenditure and costs on PHC services categories and unit costs at clinic and hospital levels of care. The following are some of the important issues discovered:

- Greater level of expenditure on PHC services at the clinics compared to the hospital on all services
- Higher unit costs of care at hospital level on all PHC services
- Capital cost has little effect on overall costs
- Inefficient and inequitable staff allocation at clinics
- Under-utilisation of some clinics

Clinic and hospital levels were found to have followed a similar trend in terms of costs. This was noted in the following aspects:

- High proportion of expenditure on curative care
- High unit cost of mental health services
- Both have low utilisation of TB services
- Relatively high unit cost of personnel

#### **4.6. Comparing unit cost of KZN study and Agincourt and AHC**

Having discovered the costs of providing PHC services at Manguzi facilities, it was interesting to compare the findings of the study with that of the Centre for Health Policy (CHP). Therefore, two sites from the CHP costing study were chosen, i.e. Agincourt (rural) and Alexandra Health Centre (AHC) (urban) for comparison. The main reason for this comparison was to see the extent to which costs of PHC services provided at a similar and/or different setting vary.

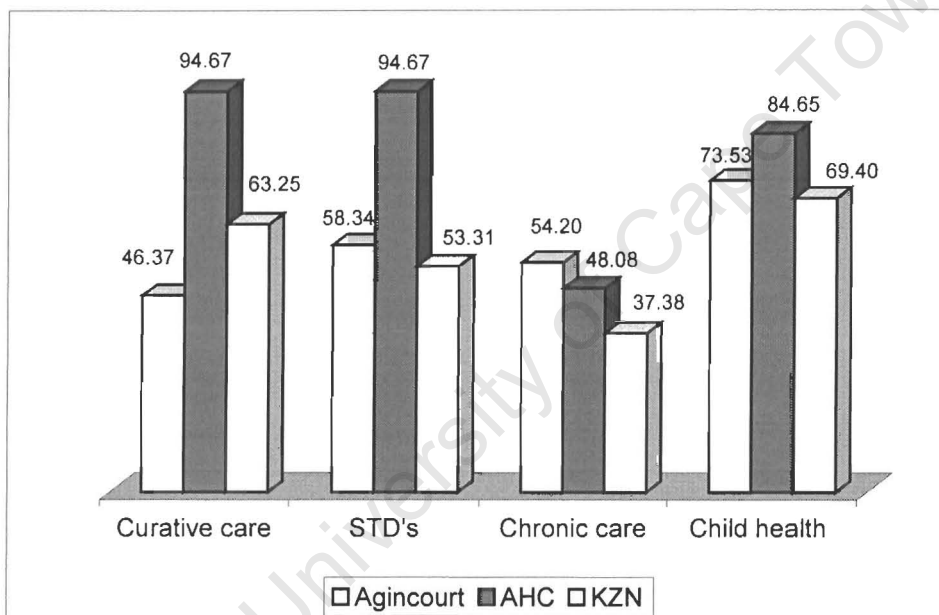
##### **4.6.1. Method used in comparison**

The current study was compared with another study undertaken by the CHP for the clinic level of care. Since the CHP study was done in 1992, eight years before the current KZN

study, costs were inflated up to 2000/1 prices using the Consumer Price Index (CPI) to enable comparison of costing results of the two studies. (See appendix for inflators)

Four PHC services were selected for the comparison, namely, curative care, chronic care, STD services and child health care services (See graph 4.7).

**Graph: 4.7. Unit comparisons between three study sites (2000/1) (ZAR)**



#### 4.6.2. Unit costs comparison

The unit costs comparison of some PHC services provided from the three study sites vary with AHC having relatively higher unit costs on most of the four PHC services compared. The unit costs are similar across the sites for chronic and child health services. Agincourt and

KZN generally had similar unit costs in most services and that could be because of their similar setting.

A possible reason for the high cost of AHC services could be that AHC is a health centre and not a clinic like the other two. Its high costs could be explained by the fact that health centres provide 24-hour services.

The fact that both Agincourt and KZN study sites are in rural settings has utilisation implications. Traditional medicines are used in rural areas, especially for minor ailments. On the other hand, people visit health care facilities when the illness is complicated and cannot be cured with traditional medicine.

Apart from comparing the unit cost of services, a comparison of the line item unit cost between these facilities was also done to assess how various line items contribute to total expenditure.

The line item unit cost analysis undertaken in these facilities was based on personnel, medicines, and other recurrent and capital costs. As personnel unit cost of Agincourt and AHC was only for clinical staff, Manguzi personnel unit cost was also for nursing staff only in this calculation.

**Table 4.9: Line item unit cost between KZN, Agincourt and AHC (2000/1) (ZAR)**

Clinics	KZN	Agincourt	AHC
Personnel	27.76	26.75	27.79
Medicines	12.83	6.24	12.51
Other Recurrent Exp.	9.24	7.58	19.46
Capital costs	5.63	3.57	5.55

Variations in the unit cost of each line item at these facilities were discovered. The category 'other recurrent expenditures' line items vary considerably with Agincourt having the lowest unit cost of other recurrent expenditures and AHC having the highest. However, the unit cost of personnel, capital cost and medicines are similar across the three study sites, except for medicines at Agincourt, which are almost a half that of the two sites.

#### **4.7. Essential health package**

SA primary health services, especially in rural areas of the former homelands, have a history of being under-resourced. Moreover, the majority of the population in those areas relies on public health care. The PHC package in South Africa has been considered as the best approach through which health services can be provided, in that it is the most efficient approach. The SA government aims at providing cost-effective health services which are accessible to all. In particular, the government aims at increasing PHC services utilisation to 3.5 visits per person per year.

It was therefore considered important to know the expected utilisation at an average of 3.5 per person per year at these facilities. The total population living in the catchment area was multiplied by 3.5.

This table shows the expected utilisation at an average of 3.5 per person per year

**Table 4.10: Expected utilisation at 3.5 visits /person/year**

Health facilities	Actual utilisation	Population covered	Average visit/person/annum/person/year	Expected utilisation at 3.5 visits
Bhekabantu	14,426	3,557	3.5	12,450
KwaNdaba	18,187	7,094	3.5	24,829
KwaZibi	8,644	9,759	3.5	34,157
Mahlungu	14,624	5,120	3.5	17,920
Mshudu	11,140	7,985	3.5	27,948
Mvelabusha	8,247	4,075	3.5	14,263
Phelandaba	24,005	10,302	3.5	36,057
Thengane	17,900	5,733	3.5	20,066
ZamaZama	16,036	6,117	3.5	21,410
<b>Total</b>	<b>178,935</b>	<b>82,293</b>		<b>209,097</b>

According to the information presented in the table above, all nine clinics would have higher utilisation than the current levels, except Bhekabantu clinic, which is already above 3.5 visits per person currently. *The question is whether the target utilisation goal can be achieved with the available resources?* As a large expenditure item, some analysis on the number of staff that would be required at 3.5 visits per person per year was undertaken.

Proportions of the current utilisation of each service were calculated by dividing the actual number of patients for each service by the total utilisation. The expected utilisation levels at each clinic at the target of 3.5 visits per person per year were multiplied by these proportions to estimate the number of visits per service category at each clinic. The inflated utilisation of each service was then multiplied by the average staff time required per service category. Finally, the required staff for utilisation levels of 3.5 visits was calculated by dividing the total weighted time for seeing patients by the actual time a staff member has for seeing patient in a year (previously calculated to be 75,900 minutes). This analysis was done for the clinic facilities only.

**Table 4.11: Required staff at 3.5 visits/person p.a.**

<b>Health facilities</b>	<b>Actual No. of Professional nurses</b>	<b>Require staff at 3.5 visits/person p.a.</b>
Bhekabantu	3	1
KwaNdaba	3	3
KwaZibi	2	4
Mahlungu	3	2
Mshudu	3	3
Mvelabusha	2	2
Phelandaba	3	4
Thengane	2	2
ZamaZama	3	3
<b>Total</b>	<b>24</b>	<b>24</b>

Based on the information presented on table 4.11, it was found that all PHC services included in the SA essential package could be provided at an increased rate of 3.5 visits per year using the existing staff. Although the study shows that it would not be necessary to hire additional staff, it would be important to distribute staff more evenly between clinics. As was found in the current staffing analysis, some clinics have considerably more staff than utilisation requires. This, therefore, shows maldistribution of staff between clinics. Table 4.11 shows that some clinics can cope with increased utilisation using available staff and some clinics can even cope with fewer staff than the current levels. For instance, Bhekabantu and Mahlangu clinics would require fewer numbers of staff at 3.5 visits than the current available staff. Both clinics currently have three professional nurses but require one and two professional nurses respectively. The fact that the two clinics would require fewer staff even when utilisation increases shows inefficiencies in current resource utilisation. However, KwaZibi and Phelandaba clinics would each require two and one additional staff respectively. Therefore, the two nurses should be moved from Bhekabantu clinic to KwaZibi clinic and one nurse from Mahlangu clinic to Phelandaba clinic.

The cost information from this study provides a useful basis for evaluating the Department of Health's estimated cost of the PHC package. Using crude scaling-up estimates based on the current unit costs at clinic and hospital levels (R61.36 and R68.79 respectively) and the distribution of utilisation at each level, per capita annual costs would be R221 at utilisation levels of 3.5 visits per person per year (See table 4.12). These figures were obtained by multiplying the current unit cost by 3.5 and by the proportions of utilisation at each level of care. Based on these figures, it seems that the unit cost is more than the government estimated costs.

However, these estimates assume that the unit costs will not change. As indicated above, expenditure on personnel would not need to increase with utilisation, and the staff unit costs would decrease. Therefore, more detailed estimates were calculated using some modelling. In order to calculate the new unit of personnel, other recurrent and capital cost, the total expenditure was divided by the total utilisation at 3.5 visits per person per year. In the case of medicines and medical consumables, it was assumed that the unit cost of these items would remain the same on average (See Table 4.12 for model calculations).

Table 4.12: Resource modeling (2000/1) (ZAR)

	Unit cost	Percentage share of visits	Scaled-up	
Clinics	61.36	74.45	159.89	
OPD	68.8	25.55	61.52	
Estimated total cost per person per year			221.34	
More detailed modelling of scaling-up costs				
	Hospital	Clinic	Total	Current Unit cost Scaled-up Unit cost
Personnel	1,882,479.59	4,484,645.70	6,367,125.29	35.58 22.11
Medicines	570,502.55	1,709,037.10	2,279,539.65	12.74 12.74
Medical consumables	3,472.83	574,508.86	577,981.69	3.23 3.23
Other recurrent	373,459.56	655,798.77	1,029,258.33	5.75 3.57
Capital	415,546.71	749,846.51	1,165,393.22	6.51 4.05
	<b>3,245,461.24</b>	<b>8,173,836.94</b>	<b>11,419,298.18</b>	<b>63.82 45.70</b>
Current visits	45,726	133,209	178,935	
Visits @ 3.5 p.c. p.a.			288,026	
Scaled-up cost per person per year				159.93

The overall unit cost is currently R63.82. In terms of the model outlined above, cost when the costs are scaled up for 3.5 visits per person p.a, the total unit drops to R45.70, which translates into R160 per person per year.

According to the NDoH PHC document, the national cost per capita was estimated to be R173 in 2000 (Brijlal and Hensher 2000). The scaled up Manguzi costs of R159.93 suggest that the government estimation of the costs per person at 3.5 visits is fairly reasonable.

#### **4.8. Conclusions**

Increased use of costing data should be considered in order to maintain efficiency in the utilisation of health care resources at district level. It is the responsibility of the person managing the whole district to evaluate the relative use of resources at all facilities in a district. Without cost data for different services, efficient use of resources may be impossible.

#### **4.9. Study limitations**

Though the study has provided information that may be useful in planning and management of health services at district level, there were some limitations. For instance, data obtained from the selected facilities were inconsistent and there were some data gaps. There were not sufficient data for the whole year for all service categories. Data gaps were filled by estimations and extrapolation. For instance, four months of data on certain patient statistics were used to calculate the proportions of other months from the total headcounts.

The inconsistent data affected the categorisation of PHC services. For instance, most PHC services categories which could have been grouped separately had to be grouped under curative services as there were so many data gaps. For example, antenatal and diabetes statistics data were very inconsistent and there was statistics for diabetes was that of pregnant women which is not chronic.

STD services were grouped separately because they were considered as one of the PHC expensive services. Therefore, the aim was to discover the STD services costs in the facilities being studied.

It is worth noting that the cost comparisons between different facilities in some cases compared clinics with health centres. For example, Manguzi and Agincourt clinic costs were compared with AHC, which is a health centre. Even though it is categorised as a primary level of care facility, it is more than an ordinary clinic in terms of its services. Some health centres provide 24-hour services which are rare in the clinics. This contributes to costs, especially on curative care, as most cases that need 24-hour services are curative cases.

Another problem was encountered in the allocation of costs from the cost centres to relevant services. As there were no data on total staff time spent performing different activities, utilisation weighted by estimated staff time per service category had to be used in allocating personnel costs.

Since there were no data on drug usage between inpatient and outpatient care at hospital as well as data on drugs sent to each of the clinics, assumptions had to be made. Though sensitivity analysis of different assumptions made was performed, this does not necessarily mean the calculations are completely accurate and reliable.

Another uncertainty on the drug data arises from the fact that the data collected did not classify medicines according to the diseases they were used for, nor identify medicines used for children. Therefore, classification of medicines was done using published treatment guidelines and some guidance from a qualified medical doctor.

It is also important to note that, the costs of some capital items such as transport (vehicle replacement and running costs), furniture and equipment may be over estimated in this study as the government can purchase these items from the dealers at lower prices.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1. Introduction**

Some key issues were identified in the costing of PHC services provided in Manguzi sub-district. Both levels of care, i.e. clinic and hospital, followed the same trend in the unit costs of PHC services in that services with relatively high costs in one level of care also have high costs in the other. Therefore the discussion on the costs of some specific services costed in both levels of care will be combined as they follow the same trend.

The following are some of the key findings of the study

- There are considerable differences in the PHC services unit cost, with mental health services having the highest unit cost.
- There are variations in the cost of PHC services provided at different levels of care
- There are some variations in the line item unit cost within facilities of similar levels and between PHC services.
- Inefficiencies in allocation of staff between clinics with some clinics having excess staff while some function with insufficient staff
- Under utilisation of some clinics with some clinics having relatively low average visits per person per year.
- The current staff in Manguzi would be sufficient to provide a comprehensive PHC package levels of 3.5 visits per person per year, but would only need to redistribute staff between facilities more evenly.

### **5.2. Unit costs analysis**

Based on the unit cost of PHC services, it was discovered that the costs of different categories of PHC services provided within one facility vary. Some services were found to be relatively more expensive than others. For example, curative, child health services and mental health services have relatively high costs with mental health having the highest unit cost. The high unit costs of mental health services at both levels of care were found to have been influenced by personnel and drug costs. Considering that some mental health problems

can be chronic, they potentially pose a demand for high use of some resources (Goossens et al. 1999).

**Recommendation:** As mental health services were found to have relatively high unit cost of some line items, i.e. personnel and drugs, it is recommended that they need to be supported and strengthened at lower levels of care. Health workers at primary level need to be equipped with necessary skills to identify mental health illnesses at onset to avoid potentially higher costs of medicines that would be required when illness is complicated.

Although costing of Manguzi health services was mainly evaluating cost of PHC services, cost comparisons between different levels of care and between facilities was undertaken. Differences in terms of costs were discovered in PHC services provided at different levels of care. PHC services provided at the hospital outpatient department are more expensive than at clinics. Considering the results of this study, it can be concluded that provision of PHC services at a hospital level encourages inefficiency in health care provision. The same service can be provided clinics at a lower cost.

**Recommendation:** The differences in costs between the two levels of care suggest use of clinics as the most cost-effective way in the provision of PHC. Therefore, for efficiency reasons, it is recommended to encourage use of lower levels. As should be happening, hospitals should be mainly used as a referral points. However, Manguzi hospital has both referrals from the clinics as well as self-referrals.

### 5.3. Efficiency analysis

Some issues of efficiency in PHC services provision in Manguzi were identified. For example, there are considerable variations in the unit costs between clinics. The extent of the variations was found to have been driven by personnel costs, which varied considerably between clinics. There were clinics which were found to have considerably more staff than

their utilisation levels justified. This therefore implies that staff are distributed between facilities unevenly and inequitably. Some clinics with relatively high utilisation levels have relatively few staff. The current distribution of staff not only raises some equity concerns but other concerns as to whether there are barriers to utilisation of the services provided at some clinics.

An important issue which has to be considered is the under utilisation of some clinics in Manguzi area. Variations in the average visits per person per year in these facilities indicate a need for further investigation as to what hinders utilisation of those clinics. There are various reasons for people not to utilise services of some facilities and those include geographic access, quality of care provided and so forth. Exploring these issues in relatively under-utilised facilities would help to resolve the problems in the facilities identified.

**Recommendation:** As the study identified some misdistribution of staff among clinics, it is therefore recommended that the district managers consider redistributing staff. If all the clinics were to operate at the target level of 3.5 visits per person per year, the staffing at the clinics should be as presented in Table 4.11.

#### **5.4. Scaling-up to the comprehensive PHC package level**

The utilisation of PHC services in Manguzi is currently far below the target level of 3.5 visits per person per year with the average number of visits per person per year being 2.23. However, Manguzi has adequate staff to provide PHC services at 3.5-utilisation rate. Although there may be other additional costs involved, when PHC services utilisation is scaled-up to 3.5 visits per person per year there would not be additional staff costs.

The estimated package costs in this study are similar to the Nod estimated essential package cost. Therefore, this study supports the NDoH PHC package cost estimates.

### **5.5. Key recommendations**

District managers, like facility managers, are often not aware of how resources have been spent in health care facilities on providing different services. The only information that is likely to be available is overall expenditure on different input categories. As much as it is important to be informed on the overall expenditure it is equally important to know the pattern of expenditure between facilities and between different categories of services.

It is also important to inform managers at district level about the costs of services at both hospital and clinic levels of care. This would enable them to better control allocated resources and be able to understand how resources were used. Understanding of expenditure and costs of care could possibly encourage cooperation between the managers at both levels of care.

In addition, understanding of costs can be useful in improving accountability of managers in the utilisation of resources; they need to be informed about how their department and facilities have utilised resources. Most importantly, information such as that analysed in this study, can contribute to improved efficiency and equity in PHC provision in South Africa.

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**APPENDIX 1: Inflated prices for Agincourt and AHC facilities**

	<b>Agincourt</b>	<b>1996/97- 1997/98</b>	<b>1997/98- 1998/99</b>	<b>1998/99- 1999/00</b>	<b>1999/00- 2000/01</b>
Curative care	27.97	29.49	29.11	29.45	29.56
STD's	35.19	37.10	36.63	37.06	37.20
Chronic care	32.69	34.47	34.02	34.42	34.55
Child health	44.35	46.76	46.16	46.70	46.88
	<b>AHC</b>				
Curative care	57.1	60.20	59.43	60.13	60.35
STD's	57.1	60.20	59.43	60.13	60.35
Chronic care	29	30.57	30.18	30.54	30.65
Child health	51.06	53.83	53.14	53.77	53.97

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