

# **Equity in the Allocation of Primary Health Care Resources in Uganda**

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This paper has been submitted for examination with my approval as the university supervisor.

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Date: 24 Nov 2018

Mr. Okore Okorafor

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## List of Abbreviations

DMMA	Decentralized Management Medical Areas
GDP	Gross Domestic Product
GID	General Index of Deprivation
HC	Health Centre
HEU	Health Economics Unit
HSD	Health Sub District
HSSP	Health Sector Strategic Plan
MOH	Ministry of Health
NGO	Non governmental Organization
NHA	National Health Accounts
PCA	Principle Component Analysis
PHC	Primary Health Care
PID	Policy Index of Deprivation
PNFP	Private Not For Profit
SID	Single Index of Deprivation
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health survey
UNMHCP	Uganda National Minimum Health Care Package

## **Abstract**

Introduction. Variations in health outcomes and health service delivery across the different regions in Uganda are evident from the Uganda Demographic and Health Survey. Infant mortality was highest in the rural areas compared to the urban areas and in the Northern region compared to the Central. This implies that different regions have varying levels of need. In order to address the existing inequities, resources for health care ought therefore to be allocated according to need. However the available research seems to suggest that the resource allocation mechanism in the health sector is not meeting the equity objective of allocating resources according to need.

Objectives. The aim of this research was to assess the extent to which PHC financial resources to the districts are allocated according to need in Uganda. Specifically the study intended to describe the formula used for resource allocation of PHC grants, to construct a deprivation index, which would be used to identify the districts with greatest disadvantage, to determine the extent of vertical equity that exists in the allocation of the primary health care grants and to construct a needs based resource allocation formula.

Methodology. This was a cross-sectional analytic study, which used quantitative and qualitative data. Methods used included key informant interviews, review of secondary data and review of documents about the resource allocation formula used for allocation of Primary Health Care grants. The secondary data included expenditure on Primary Health Care and socio demographic and household's characteristics information obtained from the census. The extent of vertical equity was assessed by constructing a deprivation index using principle component analysis. The deprivation index was then used to compare need across districts with the per capita expenditure. This was done using regression analysis. Lastly a resource allocation formula was constructed by weighting the deprivation index by district population.

Results. A deprivation index was constructed comprising of measures of social and material deprivation. The central region of the country experiences the least deprivation while the northern region experiences the most deprivation. Regression analysis between the capita expenditure of PHC in the financial years 2002/2003, 2003/2004 and 2004/2005 and the deprivation index showed no significant relationship between the two variables. The allocation of PHC resources is determined by a combination of the use of a resource allocation formula with incremental budgeting.

Conclusions and Recommendations. Deprivation can be measured in developing countries with data from surveys such as the census. Deprivation in Uganda is concentrated mainly in the Northern region. The allocation of resources for Primary Health Care is not done according to need. The ministry of health and finance should ensure that the resource allocation formula is the primary determinant for the allocation of PHC recurrent resources. Secondly areas with more need such as the northern region should be clearly identified so that resources can be preferentially allocated to them. More objective measures should be used to measure the variables included in the resource allocation formula.

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# Chapter one

## 1.0 Introduction and Background

### 1.1 Country Profile of Uganda

#### 1.1.1 Socio-economic Profile

Uganda is a landlocked low-income country situated in East Africa. It has a surface area of 241,093 square kilometres and is administratively divided into 79<sup>1</sup> districts. It has a total population of 24.7 million with 48.9% being male and 51.1% female (Uganda Bureau of Statistics, 2002). The gross national income for Uganda was USD 6.9 billion in 2004, this reflects an increase from USD 6.3 billion in 2000 (World Bank, 2006). However the GNI per capita decreased from \$ 260 in 2000 to \$ 250 in 2004. This was because the population growth rate of the country is higher than the growth rate of the economy. The percentage of the population living below the poverty line, declined from 52% in 1992 to 38% in 2003 (Ministry of Finance (MOF) 2003; UBOS, 2003). However, poverty is still recognized to be the main underlying cause of the poor health situation in the country. The associated factors are the low level of literacy, high prevalence of communicable diseases, emergence of diseases of lifestyles, inadequate and inequitable provision and distribution of social services and amenities, and the general level of underdevelopment of service infrastructure. In response to this situation, the Government of Uganda embarked on a major Poverty Eradication Programme with emphasis on the modernization of agriculture, improvement of rural Infrastructure, development of marketing opportunities, Universal Primary Education (UPE), Primary Health Care (PHC) and Water and Sanitation (MOH, 1999).

#### 1.1.2 Overview of the Health System

The World Health Report 2000 defines a health system to include all activities whose primary purpose is to promote, restore or maintain Health. Uganda has a decentralized system of governance. The organization of the health system is such that it has both a hierarchical bureaucracy as well as direct short- term market based interactions. In the latter, patients purchase care from private providers (Private for profit and private not for profit), when faced with an illness. The high out of pocket expenditure as a proportion of overall health expenditure (40.5%) is

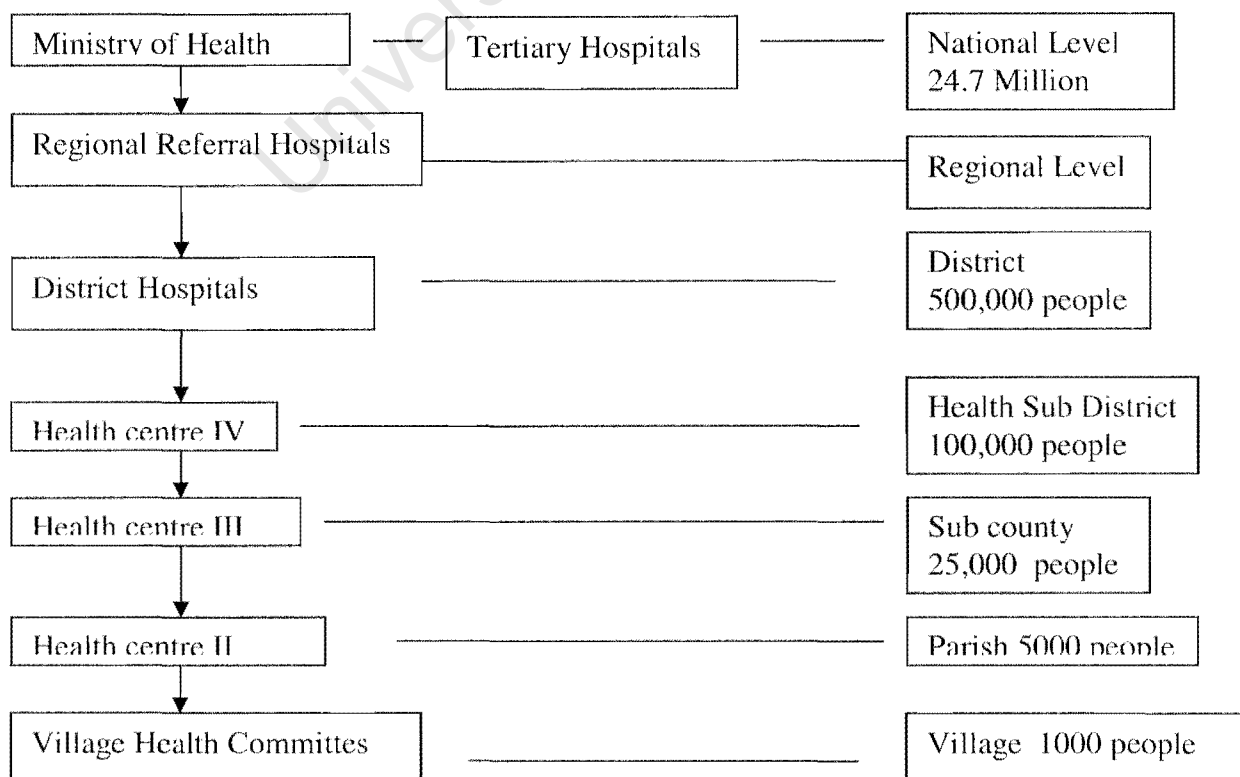
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<sup>1</sup> By the time the 2002 census was done Uganda was divided into 56 districts. This study therefore maintained these administrative zones.

evidence of the high use of private health services. In Uganda public services are provided free of charge except in the private wings of the hospitals. The hierarchical bureaucracy comprises of the Ministry of Health (MOH) and the District Health System. The MOH is responsible for formulation of policy standards and guidelines, supervision and monitoring, technical support and resource mobilization. The District Health System on the other hand, is responsible for health services delivery, recruitment and management of personnel, passing by laws related to health, planning budgeting and additional resource mobilization (MOH, 2000). Health services are provided by the Public sector (comprising of government health facilities) and the private sector. This sector comprises of Non Governmental organizations (facility and non-facility-based), private practitioners, the traditional health care system of traditional healers and midwives, and an expanding private pharmaceutical sector.

The country has 99 hospitals (55 government, 44 private not for profit (PNFP)), and 2063 health centres (1538 government and 525 PNFP). The government hospitals are in three categories; namely national referral (2), regional referral (10) and district/rural hospitals (56) (MOH, 2004). The facilities are further graded as health centres IV, III, and II. The grading depends on the administrative zone served by the facility; health sub-district (HSD), sub-county and parish. Village health committees are located at the Village level, however they are not yet operational in most of the districts. A diagrammatic presentation of the structure of the health system is provided in figure 1.1.

Fig 1.1 Structure of the Ugandan health system



The facilities provide different types of services; however, a unit can work as HC II and III or IV. If a facility has more than one grade, the highest is considered. The village health committees are supposed to offer promotive health care. Health centre II's provide outpatient care, antenatal care, immunisation and outreach. HC III offers all the services provided at HC II, as well as inpatient care and environmental health. The HC IV is supposed to offer emergency surgery, blood transfusion and laboratory services in addition to offering the services provided at HC III. It is also responsible for making plans for the HSD, supervision of the lower level units, collection and analysis of health data (MOH, 2000).

The government of Uganda has focused on the provision of health services that are demonstrably cost-effective and able to have a large impact on reducing morbidity and mortality. This is what constitutes the Uganda National Minimum Health Care Package (UNMHCP). The UNMHCP is the cardinal reference in determining the allocation of public funds. The components of the UNMHCP include control of communicable diseases, sexual and reproductive health and rights, public health interventions such as immunization, environmental health, health education and promotion, school health, epidemics and disaster prevention, preparedness and response, mental health services and essential clinical care (MOH, 1999). The guiding philosophy for the provision of the package is the primary health care (PHC) approach. Comprehensive PHC services include all services which promote good health, prevent disease, cure disease and aid rehabilitation (WHO, 1978). The PHC concept emphasises the delivery of essential health care services universally to the population. In addition, the health services should also be affordable, acceptable to the community and provided with their full participation using technology that is appropriate. This entails the provision of basic essential services at primary level and specialist services at secondary and tertiary level.

### **1.1.3 Health Status and Epidemiological Profile**

According to the Burden of Disease Study in Uganda (MOH, 1995), over 75% of the life years lost due to premature death were due to ten preventable diseases. Perinatal and maternal conditions (20.4%), malaria (15.4%), acute lower respiratory tract infections (10.5%), AIDS (9.1%) and diarrhea (8.4%) together account for over 60% of the total national death burden. Others at the top of the list include tuberculosis, malnutrition (with 38% of under-5s stunted, 25% underweight for age and 5% wasted), trauma/accidents and measles. There is also a marked upsurge in the

occurrence of non-communicable diseases such as hypertension, cancer, diabetes, mental illness and chronic heart disease (MOH, 1999).

There has been some improvement in the health status indicators compared to what they were in the early 1980's. During that period, the health sector was receiving only 2.5% of the national budget, it had ill equipped facilities and demoralized personnel (MOH, 2004). The infant mortality rate and the under 5 mortality rate for Uganda is now lower than the average for Sub-Saharan Africa while the life expectancy is comparable. The total fertility rate however is still higher than that for the region. These indices are still very poor when compared to those of the developed countries. Japan for example has a life expectancy of 82 and China 81.6 (World Bank, 2006).

Table 1.1 Health indices for Uganda compared to the average for Sub-Saharan Africa (SSA).

Indicator	Uganda			Sub Saharan Africa		
	1988	1995	2000	1995	2000	2004
Life expectancy at birth	—*	52	47	51	<b>46.1</b>	<b>46.2</b>
IMR per 1000 live births	122	81	88	92	<b>103.4</b>	<b>100.2</b>
Under 5 mortality rate per 1000 live births	203	147	152	151	<b>173.1</b>	<b>168.2</b>
Total fertility rate	7.1	6.9	6.9	5.6	<b>5.5</b>	<b>5.3</b>

Source: UDHS 1988, 1995, 2000-2001, Commission on Macroeconomics and health, December 2001, Health Nutrition and Population, World Bank 1995, 2000, 2004.

\* The statistics for the life expectancy in 1988 were not available.

Results of the Uganda Demographic and Health Survey (UDHS) have shown that there are variations in health status across the different regions. Mortality is highest in the rural population (93.7 for infant mortality and 163.4 for child mortality) as compared to the urban population (54.5 for infant mortality and 100.6 for child mortality). Across regions infant mortality is highest in the Northern region (105.9) and lowest in the Central region (71.9) (UBOS, 2002). Across socioeconomic quintiles, those in the lowest quintiles<sup>2</sup> have the highest mortality rates, for example infant mortality was 105.7 in the lowest quintile compared to 60.2 in the highest quintile. When it comes to access to health services, these inequities still persist. The national average for the percentage of people living within 5 km of a health facility was 57% as of 2000. However this ranges from as low as 5 % in Kotido (located in the Northern region) to 100% in Jinja (Eastern region), Tororo (Eastern region) and Kampala (Central region) (MOH, 2004). It is important to note however that access to a health facility does not necessarily mean access to all the components of the MHCP. In many cases not all components can be provided because of resource

<sup>2</sup> The quintiles are measured using an asset index.

constraints (MOH, 2004). Table 1.2 presents details of these inequities across a range of socio-demographic characteristics in Uganda.

Table 1.2 Health indices in Uganda compared by socio demographic characteristics

<b>Socio economic characteristic</b>	<b>Infant Mortality</b>	<b>Under 5 Mortality</b>	<b>Delivery in Health facilities</b>
<b>Residence</b>			
Urban	54.5	100.6	79.2
Rural	93.7	163.4	31.5
<b>Region</b>			
Central	71.9	135.1	56.9
Eastern	89.3	147.3	36.5
Northern	105.9	178.0	24.5
Western	97.8	176.3	21.7
<b>Wealth index Quintile</b>			
Lowest	105.7	191.8	18.4
Lower Middle	98.3	173.0	26.4
Middle	94.5	163.5	29.7
Upper Middle	81.0	136.2	44.3
Highest	60.2	106.4	76.0

Source UDHS 2000-2001

The provision of health services can make an important contribution to improving health status provided that they target the most important illnesses and are accessible to the majority of the population. Improving health services is therefore seen as one of the key strategies for achieving the fourth pillar of the poverty eradication plan for Uganda, namely enhancing the quality of life of the poor (MOH, 2002). The Government of Uganda intends to improve the health status of the population by providing cost-effective interventions that are to be implemented in an integrated manner to address priority health problems through the PHC approach. The resources for PHC are allocated to the districts through PHC grants. Their equitable allocation is important in reducing the existing inequities in health outcomes within Uganda.

## 1.2 Problem Statement

Substantial inequities in health outcomes have been shown to exist between the different regions of the country and between the different socioeconomic quintiles. Mortality is highest in the rural population (93.7 for infant mortality and 163.4 for child mortality) as compared to the urban population (54.5 for infant mortality and 100.6 for child mortality). Across regions infant mortality is highest in the Northern region (105.9) and lowest in the Central region (71.9) (UBOS, 2002). Across socioeconomic quintiles, those in the lowest quintiles<sup>3</sup> have the highest mortality rates, for example infant mortality was 105.7 in the lowest quintile compared to 60.2 in the highest quintile. When it comes to access to health services, this ranges from as low as 5 % in Kotido (located in the Northern region) to 100% in Jinja (Eastern region), Tororo (Eastern region) and Kampala (Central region) (MOH, 2004).

The poorest people in the society are the ones bearing a heavier burden of ill health and mortality. Moreover they are the ones who are often unable to access health services. This may be because they are located very far from the health facilities, and lack the means to get there or because there are no drugs in the facilities and they can not afford to purchase these drugs. Such populations are at a greater disadvantage compared to others. The Ugandan government has demonstrated its commitment to solving such problems by enacting the appropriate policies. The overall objective of the Ugandan health sector policy is to reduce mortality, morbidity and fertility, and the disparities therein. It also seeks to ensure the equitable distribution of health services to all sections of the population through further decentralization of the health care (MOH, 1999). This kind of scenario calls for a resource allocation process that will take into consideration the differential needs of the population in the different districts such that eventually those with more need are able to receive more resources. This would help in reducing the inequities in health outcomes that prevail in the country currently.

A comparison was made between the per capita allocation of financial resources to the health sector<sup>4</sup> and the Gross Domestic Product index (GDP index)<sup>5</sup> for the districts and also between the life expectancy indices using expenditure data. The results showed that the per capita allocations did not result in the preferential allocation of more resources to districts with a low GDP index or

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<sup>3</sup> The quintiles are measured using an asset index.

<sup>4</sup> This included the allocation for PHC for recurrent expenditure (wage and non-wage) and development, delegated funds, donor allocations and local government contributions to the health sector.

<sup>5</sup> The GDP index is a measure of the Gross domestic product for the district compiled by the ministry of finance.

low life expectancy index (MOH, 2004). Districts with a low life expectancy index are likely to have higher health needs and should be allocated more funds, while those with a low GDP index are poorer than those with a higher GDP index and therefore require more resources as well (MOH, 2004).

According to the NHA (2004) health expenditure (including both government and out of pocket (OOP) expenditure) by region, was highest in the central region and followed by the Western then Eastern and lastly the Northern region. The main reason given for this was the fact that OOP was highest in the Central and lowest in the North. The districts in the Northern part of the country have the highest population living more than 5 km from a health facility (MOH, 2003). They have also suffered from insurgency for the last twenty years and have the worst health indicators in the country. The fact that their OOP is low is perhaps an indication that a larger percentage of people are therefore unable to access even private services. In other areas where government services are of poor quality or inaccessible, the population resorts to private care, this option is not exploited in the North. Although, the government and donor allocations to the Northern region were higher than the allocations to the other regions, when this expenditure is compared to the need in the Northern region, the population there may actually be receiving less health care resources than required. These findings seem to suggest that the resource allocation mechanism is not meeting the equity objective of allocating resources according to need with more resources being given to districts with more need.

### **1.3 Aim and Objectives**

The aim of this research is to evaluate the extent to which financial resources for PHC to the districts are allocated according to need in Uganda. This information will be useful for guiding decision making about resource allocation.

Specifically the study aims to:

- Describe the formula used for the allocation of financial resources for recurrent expenditure on Primary health care activities in Uganda. This will be done in order to understand the process of resource allocation and its effects on the equitable allocation of resources.
- Construct an index of deprivation, which will comprise variables that will identify the districts with greatest disadvantage.
- Construct a needs based resource allocation formula based on the index of deprivation.

- Determine the extent of vertical equity that exists in the allocation of the PHC grants by comparing need in the different districts with the resources that are budgeted for each district and the resources that are actually allocated.

#### **1.4 Justification for the Study.**

Improving access to health care for all was regarded as the key to reducing inequalities in health status in the now rich countries such as Sweden when they were still poor (Diderichsen, 2004). Focus in the rich countries has since shifted from access to health care to other material and behavioral determinants of health inequality (Townsend, 1982). In the poor countries, however, unequal access and quality of health care is still considered a major determinant of inequality in health (Gwatkin 2002). Inequities in health status and in access to health services have been identified in the different regions in Uganda. Equitable allocation of health care resources to the districts can assist in decreasing these inequities. Research such as this one that concentrates on methods for allocating resources to improve equity in access to health care and to reduce inequities in health status is therefore very relevant. The information obtained will inform policy makers about the extent of equity that exists in the resource allocation mechanism in the country at present. This will guide decision making regarding resource allocation.

# Chapter Two

## 2.0 Literature Review

### 2.1 Financing of the Health Sector in Uganda

The literature review comprises of 4 main sections. The first section will give a brief description of the financing of health care, and the process of resource allocation to the health sector in Uganda. The second section will focus on a discussion of concepts that are important in resource allocation such as efficiency, equity and need. This will provide a background that will aid in understanding the study. The third section will provide an overview of the components and use of needs based formulae. The final section will focus on measurement of equity in resource allocation.

#### 2.1.1 Health Financing Strategy for Uganda

A financing strategy for the health sector combines the contributions from different sources of financing using mechanisms such as general taxes, project funding, social insurance, private insurance, and out of pocket payments. It determines the amount of funds available for health care, who controls the resources, and who bears the financial burden. The strategic choice made has distributive implications for the health status and financial risk protection of various income and age groups (MOH, 2002). The Health Financing Strategy for Uganda focuses on GOU (Government of Uganda) health services and private not for profit health services. It excludes private for profit providers and the traditional sector. These are important players in the health sector, but Government's role in these areas has been limited to regulation and specific instances of partnership, where these providers can be funded to provide aspects of an agreed minimum package of services (MOH, 2002).

The MOH has chosen to pursue a financing strategy based on the potential of the various financing mechanisms to raise the additional funds required whilst taking into account important equity considerations. It therefore intends to increase the health sector budget under the management control of the MOH, maintain a user fees policy for patients in private wings in Government hospitals and services provided by PNFP units, and implement a programme of Social Health Insurance (MOH, 2002).

### 2.1.2 Funding of the Health Sector

The percentage of government of Uganda budget expenditure on health has been increasing steadily over the years from 6.6% in 1988/99 to 8.9% in 2001/2002, and 9.7% in 2004/2005 (MOF/MOH, 2005). However this still falls short of the target of 15%, which governments agreed to spend on health during the Abuja declaration (2000). The major sources of financing for the health sector are households (40.5%), donors (27.4%), and central government respectively (17.9%). The bulk of public funding is from central government and donor resources. Parastatals (0.1%) and expenditure from local government (0.2%) combined contribute less than 1% of the public sources sub total (MOH, 2004).

There are three main ways in which the government of Uganda finances health care. The first is through the Central Government Ministry of Health budget. This budget finances the Ministry of health, national and regional referral hospitals, other autonomous health care institutions and the district health services including district hospitals and health centres II to IV. The source of the funds is from tax revenue and donor budget support some specifically earmarked for the health sector. The second is through the local government district contributions. The district health services may be allocated funds at the district level, which comprise of allocations from block grants (unconditional) from central government and local government taxes. However the health sector usually does not get much money from the local government. The third way is through the parastatals. These include all other government owned enterprises. They provide some of their employees with health services in form of medical allowances or by providing free or heavily subsidized services in privately owned clinics. Some of the parastatals have enrolled their workers into insurance schemes; a few directly reimburse workers (MOH, 2004).

The donors include the multilateral donors and the bilateral donors. Funds from the donors are channelled through central government support, district budget support, projects and Non-governmental organizations (NGO's). The Non-governmental organizations, which may be facility based or non-facility based organizations, contribute their own resources towards health service costs in addition to other funds such as from central government and donors. They contributed 13.6% of the private expenditure (MOH, 2004). Household out of pocket spending (OOP) has been the largest financing source over the three years. Given the increasing poverty levels, this leaves the poor vulnerable to catastrophic health expenditure since the health insurance industry is weak. Households are mainly a source of finance to private for profit providers, and private not for profit facilities. In March 2001, the GOU introduced a new policy to abolish all user fees for health

services in Government units except in hospital private wings. This clearly reduces the scope to attract funds from households in GOU facilities.

Around twelve community based health insurance initiatives currently exist in Uganda covering approximately 30,000 members of the population. Despite considerable investment in the form of subsidies and technical assistance, there is little sign of community based insurance schemes taking off as a major financing mechanism in the near future (MOH, 2002). Social Health Insurance (SHI), where certain sectors of the population (usually those in formal employment) are compelled to join a health insurance scheme does not currently exist in Uganda. However because of the attractive features of SHI, (including its potential to raise considerable revenues, risk pooling and cross subsidisation from richer-healthier families to poorer-sicker families) it is being investigated as a possible future financing mechanism (MOH, 2002).

## **2.2 Resource Allocation to the Health Sector in Uganda**

Money is allocated to the Ministry of Health (MOH) from the overall GOU budget by the Ministry of Finance Planning and Economic Development (MOFPED). This resource envelope covers the Ministry of Health, National referral hospitals, autonomous health care institutions, NGO Health Units, Primary Health Care (PHC), district hospitals and Regional referral hospitals. The funds for PHC are sent to the districts in the form of a primary health care conditional grant. The PHC conditional grant was started in 1997/1998 to channel funds from the central government to local governments for the implementation of the UNMHCP in public and private not for profit (PNFP) units. Initially government was allocating money to the local governments through a block grant that was unconditional. The local governments were then expected to allocate money to the various sectors. However they were allocating very little money for PHC. The grant was therefore made conditional to ensure that it is directed towards the health sector priorities (MOH, 2004).

### **2.2.1 Transfers to the Ministry of Health**

The money allocated to the Ministry of health is to be used for development purposes and for running its recurrent budget. It caters for activities implemented by the Ministry such as purchase of essential drugs, vaccines, disease surveillance, health education, AIDS control, blood transfusion services and support to non facility based NGO's. The essential drugs supplement the drugs purchased with the funds transferred directly to the districts and referral hospitals (MOH, 2003).

### **2.2.2 Transfers to the Districts**

The transfers to the districts consist of funds for primary health care for wages, non-wages and for development. District hospitals receive funds for recurrent expenses (excluding wages), while the NGO hospitals receive funds for recurrent primary health care activities (excluding wages). The public referral hospitals receive funds for wages and other recurrent expenses (MOH, 2004).

Fifty percent of the District PHC recurrent (non- wage) funds are supposed to be used for the procurement of drugs for the health centres II, III and IV. Five percent for running the district director of health services (DDHS) office. The balance of the money (45%) is to be used for running health sub districts and health centre's (MOH, 2004). This money is allocated according to the discretion of the district health teams, it should however be used for Health Sub District management activities and health centre activities such as allowances for outreach activities, transport and maintenance of the facilities. On the other hand, the PHC development funds are to be used for the construction of health centres in sub counties without Health centre II units, and in hard to reach areas, as well as facilities such as theatres, wards and staff houses at the HSD (MOH, 2003).

The money allocated to the districts is released after they have produced a work plan which is developed following the conditions and formats provided by the district guidelines on the utilization and management of grants for the delivery of health services. The work plan must be approved by the Ministry of Health, which informs the Ministry of Finance to release the funds if the plan is satisfactory (MOH, 2003).

### **2.2.3 Allocation Basis for the PHC Grants to the Districts.**

By the year 2000, part of the PHC conditional grant was earmarked for activities such as upgrading of health centres and epidemic funds. The rest of the PHC grant was then allocated to the districts according to the formula below (Pearson, 2000).

- 60 per cent – index of percentage of total population
- 20 per cent – index of (the inverse of) Human Development Index
- 20 per cent – index of (the inverse of) per capita donor and NGO spending in the district
- a 25 per cent addition was made for districts with a difficult security situation and for districts with no district hospital.

The above formula has continued to be modified since then. It is now used for the allocation of the primary health care grant (non wage recurrent). A detailed description of the resource allocation formula will be provided in the results section.

## **2.3 Efficiency, Equity and Need**

### **2.3.1 Efficiency**

A number of economic, ethical and political factors influence the resource allocation process, but the overarching principles are usually efficiency and equity (Kirunga et al, 2002). Economic efficiency dictates that resources are allocated and used in a manner, which obtains the best outcome at the least cost (Reagon et al, 1997). The central features of economic efficiency are technical efficiency, operational efficiency and allocative efficiency. Technical efficiency refers to producing a given output at minimum cost while operational efficiency relates to obtaining the maximum output out of a given set of resources. Some scholars however consider these two types of efficiency to be the same. Allocative efficiency on the other hand, aims at maximizing utility for the greatest number of people (Donaldson et al, 1993). What this implies is that resources should be distributed such that it is not possible to change the allocation process in a manner which makes someone else better off without making another worse off (Reagon et al, 1997). This study therefore advocates for resources to be allocated in a manner that allows maximum health benefits to be obtained, while ensuring an optimum mix of inputs for the delivery of services. Achieving efficiency however would not ensure that the resources are equitably distributed. Equity issues must therefore be taken into consideration during resource allocation. Unfortunately there is often a trade off between efficiency and equity and countries must find a balance between the two.

### **2.3.2 Equity**

Equity in health has been conceptualized and defined in several ways, as its principles derive from the fields of philosophy, ethics, economics, medicine, public health, and others (Macinko et al, 2002). However, before delving further into the various definitions of equity, it is perhaps important to find out why equity is so important. Differences in health have been noted between different social groups and geographic areas in every country. There is sufficient evidence to show that disadvantaged groups have poorer survival chances and die at a younger age than the more favoured groups (Whitehead, 1992). In the United Kingdom, a child born to professional parents can expect to live over 5 years more than a child born to an unskilled manual household (Black et al, 1980). Large gaps in mortality can be seen between urban and rural populations and between

different regions in the same country in both developing and developed countries (Lucas 1986; UBOS, 2002; Diderichsen, 2004). In addition there are great differences in the experiences of illness. Disadvantaged groups suffer a heavier burden of disease and experience the onset of chronic illness and disability earlier than others (Whitehead, 1992). Lastly studies have also shown that there are differences in accessibility and quality of health care services with those in most need of health care often least likely to receive a high standard of care (ibid). These are some of the reasons why equity discussions are so often the reason for international policy debates.

The Longman dictionary defines equity as a system of justice based on conscience and fairness (Longman new universal dictionary, 1982). Some people have equated equity to equality and use these two terms interchangeably. However these two terms are not always interchangeable. The dictionary defines equality as the state of being equal (ibid). Equality is therefore a particular interpretation of equity concerned with equal shares. Equity on the other hand is about fairness and interestingly at times it may be judged fair to be unequal (Whitehead, 1992). Common to most definitions of health equity is the idea that certain health differences (most often called inequalities in health) are unfair or unjust. Health inequalities that are judged unjust or unfair constitute health inequities (Macinko et al, 2002). According to Whitehead (1992) the decision about whether an inequality is unfair or unjust depends on whether they are due to inherent biological variation, due to informed individual choices, or are potentially avoidable.

A distinction must also be made between equity and the caring externality. In the latter, individuals care about seeing or knowing that others within their society receive timely needed health care. Equity however is a broader concept, capturing the notion of fairness as an independent external view. Reliance is not placed upon the benevolence felt by the rich towards the poor (Whitehead, 1992). In the context of this dissertation equity will therefore be looked at as referring to fairness and justice in the distribution of resources.

There are two main principles of equity that are commonly defined, horizontal equity and vertical equity. Horizontal equity refers to the equal treatment of equals and vertical equity, the unequal but fair treatment of unequals (Mooney, 1996). The latter definition would imply for example in the context of resource allocation, that if one area has more need than the other then it should be given more resources commensurate with the amount of need. In health economics literature, horizontal equity has been taken to be a matter of health service provision reflected in the goal of equal service inputs, access or utilization for equal need. Vertical equity on the other hand has been taken to reflect the principle of payment according to ability to pay. Health and health system

equity debates have previously focused on mechanisms for achieving horizontal equity (except literature on health care financing) (McIntyre et al, 2000). According to Mooney (1996) vertical equity warrants more attention especially in countries where there are substantial differences in health status between different groups. This line of thinking is reaffirmed by Culyer et al (1993) and McIntyre et al (2002) who also say that in order to allocate resources proportionate to the greater morbidity among the poor and to reduce the social inequalities in health, we have to look more closely at the vertical aspects of equity. However, it is at times difficult to operationalise vertical equity. This difficulty arises when it comes to assessing how unequal different groups or conditions are and therefore how unequally they should be treated in order to meet the vertical equity objective (Donaldson et al, 1993).

Equity can apply at the micro level (micro equity) where it deals with individuals for example in doctor-patient relationships, or at the interface between the patient and the hospital. It can also apply at the macro level (macro equity) where focus is for example on the equity of the distribution of health care across categories of persons deemed relevant: for example, the geographic distribution of resources. Medical ethics, traditionally devised for micro purposes, is inadequate to determine the equitable distribution of resources between programmes, specialties, hospitals, or other health care delivery agencies. For such macro programmatic decisions, judgments of a broader kind are required and this is when macro equity can be of importance (Culyer, 2001).

The majority of countries now take equity issues into consideration during the allocation of resources in an attempt to reduce differences in health outcomes that can be avoided. Differences in health status have been revealed between the rural and the urban areas as well as between the different regions in Uganda. This is illustrated for example, by the wide differences in mortality rates. The infant mortality rates in the rural regions were almost twice the rates in the urban areas (IFMR 93.7- rural compared to 54.5-urban) while the IFMR in the Northern region was 105.9 compared to 71.9 in the central region (UBOS, 2002). The Northern and Eastern parts of the country have also suffered from civil strife more than the central and western regions. Hence there is a variation in need across the districts, which would warrant the distribution of resources according to need, giving the areas with more need more resources. In view of the preceding discussions, this study will focus on macro equity and it will take the vertical equity perspective.

### 2.3.3 Equity, Ideologies and Justice

Equity is traditionally understood as being rooted in the notion of distributive justice, which focuses on the distribution of health outcomes across individuals and groups within society. However, some recent contributions to equity debates have also highlighted the importance of procedural justice, which emphasizes fairness with respect to processes (such as access and financing) rather than outcomes (Mooney, 1996; Gilson, 1998a). The practical mechanisms in which concerns for procedural justice and vertical equity can be reflected are still under exploration (McIntyre et al, 2000). According to Mooney et al (1997), a purely distributive justice orientation to vertical health equity however would include the possibility that it would advocate health equality; a situation, which cannot be easily achieved. In consideration of procedural justice, it is suggested that in determining resource allocation patterns that reflect vertical equity goals, consultation within the society should be encouraged in order to assist in the prioritisation of groups with varying needs and the additional weighting required (Mooney et al, 1997). Gilson (1998c) emphasises that consultation may not, however, by itself ensure that the voice of the poorest is heard in decision-making. Other specific actions to put the needs of the poorest at the heart of health policy development and implementation need to be taken. This is especially relevant since the notion of procedural justice emphasises that opening up decision-making processes is important in itself rather than only as a means of determining fair distributive outcomes (McIntyre et al, 2000).

Ideological perspectives will profoundly influence the nature of a society's health system (McIntyre, 1997). It will therefore impact on the distribution of health care resources. Veatch (1981) and Gillion (1986) identified five theories of justice, which are relevant to the health sector. The Entitlement or Libertarian theory suggests that everyone is entitled to what they have so long as they acquired it justly. It therefore implies that those who are better off are under no obligation to help the worse off. Looking at it from the context of resource distribution in decentralized settings for example districts which are able to generate more resources perhaps because they can earn more revenue from taxes would not be obliged to share their resources with the districts which have less. Libertarianism would therefore favour a system where health care is distributed on the basis of willingness and ability to pay with state involvement restricted to providing a minimum standard of care for the poor (Williams, 1993).

Utilitarianism on the other hand supports maximising utility for the greatest number of people. The Maximin theory exemplified by Rawls theory of justice involves maximising the benefit to the

least advantaged. He presumes that if people are operating behind a veil of ignorance, such that they do not know their position in society, they would prefer to give priority in the distribution of social goods to those who are worst off. Egalitarianism refers to equal net welfare for all individuals. The Egalitarians also believe that access to health care is every citizen's right, which ought not to be influenced by income and wealth (Williams, 1993). Marxist theory highlights the importance of needs in the distribution of services. These latter two theories would therefore favour health systems where services are distributed according to need and financed according to ability to pay (ibid).

The perspective of this study comprises of a combination of the Egalitarian and Marxist principles which would aid in promoting equal net welfare for all individuals by allocating resources in such a manner that the differential needs of the society are met.

#### **2.3.4 Need**

If equity is defined as the distribution of health care according to need, then it is important to define need. Defining needs is difficult due to the inherent complexity of the concept of 'need', so it is not surprising that numerous definitions have been proposed (Asadi-Lari et al, 2003). In a sociological environment, Bradshaw (1972) defined need as normative when it is clinically determined. When it reflects the desires of individuals he referred to it as felt need while when it expressed the vocalised needs of people for example how they use services he referred to it as expressed need.

In the philosophy literature, need is unanimously equated with ill health, such that people who are more ill are considered to have more need (Williams, 1962; Gillion, 1985). This has also been found in the economics literature especially in the empirical work on equity in the delivery of health care (Le Grand, 1978; Wagstaff et al, 1991). People with similar health status are thus assumed to have the same need and people with dissimilar health status different needs. However not all the empirical literature agrees with this viewpoint. Some authors have made it clear that need cannot be equated with morbidity, suffering and disability although they are all related to need (Culyer, 2001; Diderichsen, 2004). The problem with a definition that equates need to ill health is that a person may be ill but they may not require health care if it cannot improve their health. A person cannot be said to need health care except if they can benefit from it. The condition of illness may not have a remedy, or may need medical research but not health care as such (Culyer et al, 1993). This line of thinking contributed to a definition in which need is equated

to capacity to benefit and defined as the ability of people to benefit from health care provision (Stevens et al, 1998). This is one of the definitions that is commonly cited in health economics literature.

Although this was an improvement of the former definition, it was felt that it still left some questions unanswered. How much health care does a person need? To answer this, a normative element was introduced which was, how much care the person ought to have (Culyer et al, 1993). According to Weale (1978) this would then imply that if we say A has greater needs than B then we are saying that A needs a larger set of primary goods than B does in order to achieve the same level of welfare. Need was then redefined and seen as the amounts of productive health care required to attain equality of health or stated differently, expenditures a person ought to have. However this definition combines both normative and technical elements and yet it was viewed that the assessment of need is basically a technical exercise. At this point the relationship between health care and its principle output health improvement was considered to be important in the definition of need. Hence, another definition of need believed to be superior to the others evolved. In this one, need is defined as the expenditure required to effect the maximum possible health improvement or stating it differently expenditure required to exhaust capacity to benefit (Culyer et al, 1993). This definition according to Culyer (2001) "captures the instrumental nature of need by defining it in terms of what is needed—resources. It also relates the need for resources to the moral objective sought—health for "flourishing"—which gives need its special moral status. It also defines a finite quantum of need (namely that which exhausts capacity to benefit)." This definition clearly differentiates need from capacity to benefit, which is defined in terms of outputs (improved health compared to what would have happened without the health care intervention) (ibid).

It is important to differentiate individual and population-based health needs. Individuals perceptions differ from person to person, thus if need is defined on an individualistic basis, this may promote inequities (Reagon et al, 1997). However, both macro- and micro-health needs are important in different settings of health decision making (Culyer, 2001).

Several authors have alluded to the fact that it is difficult to measure need accurately (Reagon et al 1997; Diderichsen, 2004). Hence several approaches have been adopted, as a proxy for assessing a population's healthcare needs. According to Reagon et al (1997), the most practical way to estimate normative need is to measure the degree of ill health and the required amount of preventive health measures for maintaining health. These factors can't be measured directly but proxy measures such as; age categories, gender categories, population size, morbidity and

standardized mortality rates are used. In this study the normative definition of need will be adopted and need will be measured using proxy measures.

As a result of resource constraints all the existing needs cannot be met. If resources are insufficient to exhaust all capacities to benefit and if it is deemed efficient and equitable not to divert resources from other (non-health) uses, then the question arises as to what is the most equitable way of distributing existing resources across the range of needs. Some individuals may receive none and those who receive some may not receive all they need, either of these scenarios may be compatible with equitable resource allocation (Culyer, 2001).

A number of policy and program evaluations intended to assess the varied responses of communities and nations to health inequities have been advanced. The three main types of approaches include, increasing or improving the provision of health services to those in greatest need (Pulitzer, 2001; Yip, 2001), restructuring health financing mechanisms to aid the disadvantaged (Gilson L, 2000; Keskimaki, 1995) and altering broader social and economic structures intended to influence more distal determinants of health inequities. Few articles in the health literature address the latter approach (Macinko et al 2002). The next section of the review now focuses on a review of the literature on resource allocation and how this can be used to address health inequities.

## **2.4 Resource Allocation**

Resource allocation refers to the distribution of resources, and in particular finance, from the centre to peripheral levels (Green, 1992). Decisions about the allocation of health care resources determine the kind of health care services that exist in a society, who will get them, who will deliver them, and how the burdens of financing will be distributed (Bryant, 2002). The responsibility for resource allocation rests at the central level, which has to ensure that the scarce resources are distributed equitably between the different regions. Peripheral levels on the other hand will be concerned with maximizing the resources available for service provision in their area. Improving equity in the geographic distribution of resources is of no value if the capacity to efficiently use these resources does not exist within the district health authorities (Reagon et al, 1997).

Resources, for administrative reasons, are often allocated as they always have been in the past using historical budgets. Much as it is reasonable to provide funds for efficient use of a service structure that is already there, existing infrastructure is often poorly distributed, so in practice this

method of resource allocation perpetuates inequitable patterns of distribution (Rice et al 2001; Pearson, 2000). Other times, the allocation process basically includes negotiation and political compromise. Such that, the distribution of health resources is heavily influenced by more vocal, urban populations and by political and other vested interests. The result is that health systems are not geared towards serving the health needs of the population (especially those of the poor), and resources are heavily concentrated in highly visible, urban hospitals (Pearson, 2000). In the quest for an equitable means of resource allocation, many countries have now moved on from using historical methods to using needs based formulae some however use a combination of both (ibid).

#### **2.4.1 Review of Resource Allocation Formulae Used in Developed and Developing Countries.**

Needs based formulae have been used mainly in industrialised countries where the required data and skills for developing the formulae are available. However with the realisation that shifts in resource allocation are difficult to achieve without these formulae, their use is spreading to the middle income and low-income countries as well (Reagon et al 1997). One of the initiators of the use of needs based formulae was Britain. Serious attempts to devise more equitable mechanisms for resource allocation for the National Health Service (NHS) started in the 1970's, when it became clear that funding to the regions based on historical activity had perpetuated the inequalities in funding that existed before the NHS (Mays, 1995) The Resource Allocation Working Party (RAWP) developed a formulae for distributing resources from the central government to the regions (Department of Health, 1976). It used population size as the initial measure of need and then modified it, by weighting it according to the age and gender composition of the population, standardised mortality rates and socioeconomic status of the population (Reagon et al, 1997). The formula was in use from 1977 to 1990 and gradually managed to redistribute resources from the metropolitan regions to the poorer regions in the North (Holland, 1986).

The argument that the measurement of need should be based on empirical data led to a new formula for weighted capitation, applied from 1991 to 1995 (NHS Management Board, 1988). This empirical approach was severely criticised. The age cost weights were criticised for overcompensating for the costs of providing health care to elderly people because of their crude method of calculation (Raftery, 1993). They excluded the costs of day cases and did not distinguish between the hotel and treatment costs of hospital episodes, which are known to vary with age (ibid). Utilisation measured by admission rates at the small area level was used as the measure of need, with an attempt to adjust for the current level of supply of health care facilities (Coopers et al, 1993; Royston, 1993). Since variations in use of services may be explained by variations in supply, a formula based on variations in use between even small areas will partly

reflect variations in supply. Secondly, since the objective of the weighted capitation formula was not to identify relative need or morbidity but to allocate resources with the aim of meeting these needs. It was then also necessary to estimate the costs of treating that morbidity, (Carr-Hill, 1997) something which neither the RAWP nor the review attempted (Sheldon et al, 1993).

The use of standardised mortality ratios has also been criticised heavily. Proponents of using mortality data or at least standardized mortality rates however claim that the measure summarises the cumulative social and health experience of people living in an area and is a sensitive indicator of general health care needs (Martin, 1995). It is also reported to be a powerful predictor of community health care use and unlike other variables which are derived from the census in the UK it is available routinely on a regular basis and is not manipulable (Sheldon, 1997). Lastly, weighted capitation like the RAWP does not take account of the distribution of spending on family health services. Family health services authorities are funded on the basis of previous spending, both for their administrative and service costs. They in turn provide funds to practices in a variety of ways. Overall there is no guarantee that resources are made available on the basis of local population needs (Diderichsen et al, 1997).

As a result of the above criticisms, the Department of Health commissioned health economists at York University to develop a more sensitive, empirically based model, to be incorporated into a third allocation formula from April 1995 onwards (Diderichsen et al, 1997). In this model also known as the York model, need is measured by mortality, self reported morbidity, and various socio-economic variables. Analysis is based on an ecological study of small areas to identify the determinants of inpatient services. The estimates are adjusted for the confounding influences of supply on geographic variations in use (Noyce et al, 1997; Klein et al, 1997). The effect of applying the formula in full at the district level would be to redistribute funds towards poorer, inner city areas (Klein et al, 1997). The Department of Health decided, however, that the full York model would apply to only 76% of funding and the new arrangements would be introduced only gradually over several years. Other adjustments for "market forces" were also added. In effect, these adjustments watered down the full potential of the York model to allocate resources equitably. As the bulk of NHS funding is distributed through these formulae, even slight adjustments can make a big difference to local allocations (Diderichsen et al, 1997).

Like Britain, Sweden has a National Health Service, publicly funded and provided. A large percentage of the total healthcare budget comes from regional income taxes raised by the 26 county councils responsible for administering health care. This regional funding used to be

distributed directly to public hospitals and primary care centres on the basis of historical activity, adjusted for inflation (Diderichsen et al, 1997). The formula used in Sweden is based on individual level data. Individual level analysis was chosen not only because of the practical availability of data but also because of the problems inherent in ecological analysis (Diderichsen et al, 1997; Morgenstern, 1982). Demographic and socio-economic variables are used as proxy measures of healthcare need. These measures were used because there was evidence showing that use of hospital services in Sweden was proportional to the relative need of major socio-economic groups (Haglund, 1994). Secondly it was difficult to find a direct indicator of health status for measuring healthcare need that could be linked to individual use of health care and cost data (Diderichsen et al, 1997). Actual, rather than estimated, relative costs of health care are also used. Higher use by more socially disadvantaged groups is assumed to translate into higher costs of care, for which health authorities need to be funded. The resulting model allocates proportionately more resources to populations with poorer health and socio-economic characteristics (ibid).

Needs based formulae are also being used in South Africa. The equitable shares formula is used to allocate resources between provinces. It consists of four main components and two smaller components each of which is given a specific weight. These include an education share (51%) based on the size of the school age population and the average number of learners enrolled in public ordinary schools, a health share (26%) based on the proportion of the population with and without medical aid, a basic share (14%) derived from each province's share of the national population, an institutional component (5%) divided equally between the provinces, a poverty component (3%) and an economic output component (1%) based on the gross domestic product by region (National Treasury, 2006).

Before decentralization in Colombia and Chile, no explicit population-based formula existed to allocate resources to municipal and district facilities. The yearly budgets were based on budgets from previous years and probably reflected earlier investments in facilities and human resources. In Colombia this resulted in a system that did not redistribute resources to the poor (Bossert et al, 1998). Decentralization of financing in Colombia resulted in the transfer of funds and responsibilities to department governments (equivalent to provinces or states) and municipal governments. The process used two adjusted, population based formulae to assign resources from several central sources to each department and municipality. One source, "municipal participation", used municipal population adjusted for poverty level, unmet basic needs, own-source fiscal contribution, administrative efficiency and quality-of life indicators. The second

source, “situado fiscal”, was based partly on equal allocations to all departments and municipalities and partly on a per capita and inflation-based formula (ibid).

In Chile Decentralization of financing resulted in the allocation of intergovernmental transfers specifically assigned to primary health care and directly allocated to the municipalities based on a per capita formula adjusted for rurality and municipal poverty level. In addition, municipalities could assign their own local revenues from municipal budgets to health or to several other social and civic services. Chile also had a horizontal equity fund for municipalities that redistributed local funds from wealthier to poorer municipalities based on a per capita formula (ibid).

Tanzania, Uganda and Zambia are examples of low developing countries, which use needs, based resource allocation formulae, to allocate resources to the districts (Semali et al, 2005; Diderichsen, 2004).

#### **2.4.2 Components of Needs Based Resource Allocation Formulae**

There seems to be a general consensus in the literature that resource allocation should be needs based. However the main issue that has warranted discussion is what is an accurate measurement of needs and therefore what should be the components of these formulae? The needs based formulae currently in use vary and range from simple per capita formulae to more complex ones (Reagon et al, 1997). No single indicator can reflect need, and thus a range of indicators must be used (Doherty et al 1996). According to Pearson (2000), the main components of a needs-based resource allocation formula should reflect the main reasons why health needs vary. The proxies that are generally used include population size, age and sex profiles of populations, health status indicators such as morbidity and mortality and socioeconomic indicators such as income, employment levels and housing (Pearson 2000; Diderichsen, 2004; Reagon et al, 1997).

Population size has been used as the primary indicator of need for health services within geographic areas in most formulae (Doherty et al, 1996). This can result in reduced allocations in areas where there are cross boundary flows if they are not catered for. Countries with a developed health insurance scheme also need to make sure that they subtract the population on medical aid when using population as an indicator (Reagon et al, 1996).

Age and sex profiles of populations also need to be taken into consideration. The very young and very old have greater health needs than the general population. Children contract diseases easily especially in their younger ages, need services such as immunization and growth monitoring. A

high population of children therefore may result in more need. The elderly are prone to developing chronic diseases and need more health care per disease because they have lower healing rates (Pearson, 2000; Reagon et al, 1996). Generally, in rich countries age (above 75) plays a predominant role and in poor countries it is the under 5 age that is usually important (Diderichsen, 2004). Women and men have different morbidity and mortality profiles, and thus have different requirements for health services. In addition during their reproductive ages women require more health services (Reagon et al, 1996; Pearson, 2000). However because the gender distribution may be very equal across areas, it may often be omitted (Diderichsen et al, 2004).

Ethnicity in terms of race, citizenship, or country of birth is often used. In some countries, some ethnic groups have been found to underutilize health care—for example, the Maori people in New Zealand and non-Nordic immigrants in Sweden (Diderichsen, 2004).

Socioeconomic indicators are important because the socioeconomic status usually influences the level and type of need. Poor people tend to suffer more ill health, and disease profiles differ according to socioeconomic status. Poor people also require more resources per episode of ill health because they have a lower recuperation capacity. The rate of complications are also higher among poor people (Mays, 1989). The indicators that are often used to measure socioeconomic status include employment status, education and level of income. As education, occupation, and income, is strongly linked, experience from Sweden and other places shows that applying one of them is sufficient (Diderichsen, 2004).

Geographical factors might be relevant either because they catch variation in need factors on aggregate level (e.g. mortality rate) or because they influence market forces influencing the cost of providing care as in the English example or because the effects of demographic and socioeconomic factors are modified by location as in the Swedish example. The problem is that geographical effects often are strongly confounded by supply factors (ibid).

Since the disease profile of a district is likely to influence its health needs, it has been argued that morbidity can therefore measure health needs. As a result of lack of reliable data on morbidity however, utilization data is usually used for its measurement. The problem with this is that it tends to reflect morbidity at the health facilities and under estimates the total morbidity of the population (Carr-Hill, 1989). In the resource allocation formulae used by several countries (Britain, Sweden, Northern Ireland), it is assumed that the different needs for health care among sectors of the population are matched by their differential use of health services. This has been criticized by

authors who claim utilization does not accurately reflect true need and neither is it an adequate guide to future requirements including unmet need. They also claimed that utilization is affected not only by legitimate need for health care but also by supply factors such as the presence of health facilities and other socioeconomic factors (Diderichsen et al, 1997; Newbold et al, 1995). Furthermore, the fact that one area has 30% greater utilisation does not imply 30% more cost if the pattern of morbidity (case mix) is different. In such a case it is then necessary to estimate the costs of treating that morbidity (Carr-Hill, 1997). An attempt to adjust for the current level of supply of health care facilities in order to eliminate the effect of variation of supply is made in the weighted capitation formulae (Coopers et al, 1993; Royston, 1993). The Swedish formula caters for the costs of treating patients by using actual and not estimated costs (Diderichsen et al, 1997). It must be noted that this requires a very comprehensive data collection system, which does not exist in most countries.

In an attempt to cater for the fact that cases that do not report to health facilities are not captured by the health system, some countries have used conditions such as cancer, heart disease and psychiatric disease. It is assumed that patients with these conditions will report to hospital such that the distribution of illness is a closer reflection of actual need. This situation may not prevail in low-income countries where services are often fragmented and access is unequal, with poor recording of cases (Diderichsen, 2004). Lastly when using self-reported morbidity from surveys, caution must be taken since there is evidence that contextual factors influence the correspondence between self-reported morbidity and more objectively measured and medically defined morbidity (Diderichsen, 2004).

Because of the difficulties in obtaining comprehensive morbidity data, a lot of formulae in the developed countries use mortality, especially the standardized mortality ratio. It is routinely available in the developed countries and provides some indication of relative burden of disease between geographic areas (Reagon et al, 1997). However, Diderichsen argues that there isn't a 1:1 relationship between mortality and need such that, 10 percent higher mortality should imply 10 percent more resources. Besides, most countries are facing epidemiological transitions with declining mortality and increasing or unchanged morbidity in non lethal conditions. Mortality might then be decreasing in relevance as a reflection of need. Using mortality rates may also introduce a perverse incentive such that effective care that lowers mortality rates would be punished via a declining budget (Diderichsen, 2004). Furthermore in most low-income countries mortality data will be unavailable on a regular basis for local areas, as they are based mainly on

surveys on population samples that cannot be broken down to small geographical areas (Diderichsen, 2004).

In an attempt to avoid the problems associated with using epidemiological data as proxies for need most countries use demographic and socioeconomic indicators related to need (need factors). They tend to explain variations across geographical areas or other populations, better. For example in urbanized societies where housing segregation usually implies geographically contrasting population structure in terms of age, ethnicity, income, and other characteristics (Diderichsen, 2004). However with regard to predicting variations in health across individuals they are not the most accurate. Studies from low-mortality countries show that even a combination of several demographic and socioeconomic determinants (e.g., age, gender, ethnicity, marital status, education, and employment) seldom explains more than a few percentage points of the variation, and even with the introduction of data on earlier morbidity these figures seldom reach beyond 20 percent (Kapur et al, 2000; Rice et al, 2001).

When need factors are used, their selection and weighting has to be based on some kind of empirical analysis. A number of countries use existing patterns of utilization or costs as the yardstick for testing and weighting different potential need factors. This may seem to contradict the argument that allocating resources according to utilization would perpetuate existing inequities. However it is not variations in utilization across purchasers that should be used as the yardstick but rather variations across those demographic, socioeconomic and epidemiological variables that are potential determinants of need (Diderichsen, 2004). This is usually done by constructing models where utilization or costs are regressed against potential need factors (Carr-Hill et al, 1994). Confounding factors such as supply of health care is often included as they might influence utilization and may be unevenly distributed across population groups classified according to the need factors. A regression model will then look like:-

$$\text{Utilization or cost} = \beta_1 \text{need factors} + \beta_2 \text{supply-factors} + \text{constant.}$$

Where  $\beta_1$  represents a range of coefficients linked to the different sociodemographic “need factors” and  $\beta_2$  represents coefficients for “supply-factors”.

The need factors are then selected and weighted with the help of the non zero values of the different  $\beta$  1's. This method, however, builds on some assumptions. One of them is that there is equity in utilization across groups within the population served by each purchaser. This means that variation in utilization across different levels of each need factor used should be proportional to variations in need (ibid). This kind of analysis requires data sources where data on utilization or costs across units of analysis can be linked to information on both need factors and supply. This

can be obtained from individual- or group-level (ecological) studies. When only aggregate data on utilization are available then ecological studies are the only choice. The advantage with this approach is that the range of different data available on both need factors and supply is often much greater than at the individual level. While the disadvantage is that the weights derived from the analysis might be seriously biased by cross level bias (weights estimated by group-level studies might be biased if applied in an individual-level capitation) (ibid).

Several authors have suggested that indicators of socioeconomic deprivation should be included in resource allocation formulae (Mays et al, 1987; Moore, 1992). The concept of deprivation refers to the material and social conditions that are experienced by individuals and households, where these conditions are inadequate relative to what is usually available or experienced in society (HEU, 2003). It is a broader measure than poverty, which is usually defined as lack of income, and takes into account a wide range of factors that would render an individual or household more disadvantaged than others. One of the reasons commonly given is that social deprivation is a cause of (or associated with) morbidity (Townsend, 1990). Another justification advanced is that social deprivation variables tap aspects of need for resources not adequately represented by morbidity measures--for example, that it is more difficult to provide services in a deprived area or that effectiveness is reduced by adverse conditions (Sheldon, 1993). However Sheldon (1993) goes on to argue that rarely are such rationales clearly worked out and there is little evidence to indicate the resource implications of this even if they are valid. Further criticism is based on the fact that when a measure such as mortality which reflects deprivation has been included, there is no need to add another measure for deprivation because it leads to double counting and interferes with the additive nature of the formula (ibid). Furthermore, although there is some additional variation in utilisation rates which is explained by social factors, it is relatively small (Coopers, 1988) and does not necessarily mean that additional variation in morbidity would be explained (Sheldon, 1993).

Other critiques argue that if it is decided that a measure of material deprivation is informative and conceptually sound, then simple measures based on easily available and regularly updated measures would be preferable to the opaque and statistically complex derived indices. Data such as unemployment rates have been shown to perform as well as other, more complex indices (Campbell et al, 1997) and are likely to have a more stable social meaning across areas and over time. McIntyre et al, (2000) in South Africa also found that simple un weighted indices or even a single index may be effective in identifying small areas with high deprivation levels, to which resources can then be preferentially allocated.

While needs based formulae concentrate on allocating resources primarily according to the amount of need, Mooney (2004) is advocating for a new approach. This approach should first of all consider the capacity of the community to benefit from the resources, secondly weigh this capacity to benefit according to societal preferences, thirdly compensate areas with a poor Management Economic Social and Human Infrastructure (MESH) and lastly consider differential costs of service provision. According to him the principle question that should be asked before resources are allocated is what capacity is there to benefit from these resources. He argues that resources should not simply be allocated according to the size of the problem as the needs based formulae advocate, they should be allocated according to the communities capacity to benefit.

Different health services are likely to differ in their capacity to produce benefits for the people they serve. This may be because they are better placed or better equipped to deliver services to their population, or some health problems are more amenable to interventions than others, or other populations already have a relatively good level of health so their capacity to benefit further is limited compared with others (Mooney, 2004). The MESH infrastructure in a community contributes to the ability of the community to invest in programs. MESH involves good management, requires availability of resources, and needs a socially well functioning community and good human resources especially in terms of leadership skills (ibid). Communities that have a poor MESH infrastructure therefore need to be allocated resources with a deliberate effort to improve this so that they can benefit from the resources allocated to them. He also advocates for the weighting of capacity to benefit according to social preferences. The value attached to nominally equal benefits may be different depending on who the recipients are. Therefore society should decide according to their preferences, the relative weights to be attached to the different degrees of disadvantage (Mooney, 2004).

In summary, in the developed countries sophisticated formulae that capture the relationship between ill health and poverty have been developed, but these would not be recommended for use in low-income countries where reliable data is scarce (Pearson, 2000). Lessons that have been learnt in other countries that have used needs based formulae can instead be taken and used appropriately. The best use of available data should be made. This has resulted for example in an analysis based on area of residence (ecological analysis) in Britain and an approach based on data from individuals in Sweden. Several commentators have concluded that individual level analysis is the better option, to reduce the problems of confounding and misclassification (Benzeval et al, 1994; Carr-Hill et al, 1996). Need factors should be chosen in a way that precludes purchasers from manipulating them. Otherwise they may introduce perverse incentives that counteract efforts to

improve efficiency and effectiveness (Diderichsen, 2004). When costs of care are included bias may occur if estimated and not actual costs are used. This was revealed by comparison of estimated costs in 1995 with actual costs in 1996 in the Swedish formula (ibid). The implementation of the Swedish and the British models both illustrated that resource allocation is highly political. This is especially problematic when it involves shifts in large sums of money (Diderichsen, 2004). The redistribution process therefore needs to be done with caution. Lastly needs based formulae have limitations, which need to be taken into consideration when they are being used. For example the process of weighting the indicators can be manipulated, they also tend to deal only with recurrent expenses or specific services so other formula need to be developed to cater for capital costs (Reagon et al, 1997).

## **2.5 Measuring Equity for Resource Allocation**

Several studies have been done in an attempt to assess the degree of equity that exists in resource allocation, various methods have been used. Many of them involve the construction of an index, which is then used to measure health needs. In North-eastern Mexico (Rocha et al 2004), the grade of equity in resource allocation in decentralized management medical areas DMMA's<sup>6</sup> was assessed. They developed an index for health needs, which comprised of three separate indices, one for the use of preventive services (e.g. immunization, family planning use), another for material resources (e.g. no of offices, beds) and another for health status (healthy life years were used). Equity was considered as higher resource allocation to higher health needs. The degree of equity was measured according to concordance between the position of the DMMA with respect to health needs and its position in per capita health expenditures. The higher the degree of concordance was, the higher the degree of equity. Low concordance was found between these variables in the studied medical areas ( $r = 0.19, P > 0.05$ ) signifying that the allocation of financial resources was not in accordance with these needs (Rocha et al, 2004). To create a global index such as this one there must be reliable data about each of the components. In situations where data recording is poor it may not be feasible to use a formula such as the one used in this Mexican study.

Other researchers have developed a deprivation index and used this to calculate equity share targets, which are then compared with the actual allocations. In South Africa (McIntyre et al,

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<sup>6</sup> These are limited geographical areas of a social security institution

2000) three different indexes were developed, a general index of deprivation (GID<sup>7</sup>), a policy-perspective index of deprivation (PID<sup>8</sup>) and a single indicator of deprivation (SID) comprising of the percentage of houses with no access to running water. The indices were used to determine the geographic distribution of deprivation in South Africa and then the implications of the geographic distribution of deprivation for government resource allocation policies were evaluated by including the population weighted according to the GID and the PID in the resource allocation formula. Deprivation in South Africa was found to be concentrated in a few provinces mainly Northern Province, Kwazulu-Natal and Eastern Cape. Gauteng had the lowest levels of deprivation, followed by the Western Cape. When the equity target shares were compared with the actual allocations made by the equitable shares resource allocation formula used by the National Treasury to allocate resources to the provinces, it was found that it did not achieve the vertical equity objective of favouring the allocation of resources to the less deprived areas (McIntyre et al, 2000). For example the Eastern Cape was subject to receiving budget cuts while Gauteng was receiving budget increases (McIntyre et al, 2000).

Similarly, Semali (2005) analysed equity in resource allocation in Tanzania, and compared these allocations to equity target allocations, using an index of deprivation. The index of deprivation was derived from variables computed from the census data. The variables included in the index were percentage of households without a toilet; the percentage of children not enrolled in primary school; and the percentage of the population that is illiterate. The results revealed that districts currently receiving relatively high allocations according to the current poverty-based formula would receive slightly lower budgets if the deprivation index was used in the resource allocation formula. Those with very low allocations would receive slightly more if the deprivation index was used to guide resource allocation. However, the resource allocation differences between the poverty-based and deprivation-based formula were small, suggesting that Tanzania is addressing equity in resource allocation between districts. These studies show that deprivation indices can be developed when the data is available and they can therefore provide a useful means of measuring equity in the allocation of health care resources.

Bossert et al (1998) did a study to investigate the relation between decentralization and equity of resource allocation in Colombia and Chile. It is commonly argued that centralized systems are

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<sup>7</sup> The variables comprising the GID were living in a rural area, children under the age of 5, having no access to a phone, no access to any form of formal refuse disposal, older than 25 with no schooling, no access to electricity for lighting, having no piped water on site or in the house, living in a traditional dwelling, informal shack, living in a female headed household, unemployment, and gender.

<sup>8</sup> The Variables in the PID comprised of the poor, black, elderly, women, children, those in rural areas.

more likely to redistribute resources in favour of poorer areas and that local control and local financing will disadvantage poor communities by allowing rich communities to fund more and better health care services (Prud'homme, 1995; World Bank, 1997). He used the "decision space" approach for comparative analysis of decentralization of the health systems (Bossert et al, 1998).

To measure equity, he used per capita expenditures at the municipal level and utilization of health services (measured by the number of medical consultations reported by the routine health information system of the ministries of health). The authors alluded to the shortcomings of using these particular measures of equity. Per capita expenditure does not address the allocation of resources within the municipalities, the adequacy of types of care (or the quality of care) or the variations in alternatives to public sector provision, it also assumes that health needs are similar across the populations. However in scenarios where the required data is not available, per capita expenditure may be the indicator of choice in spite of these limitations. The use of utilization as their second measure of equity does not take into account variations in quality or types of health services or the use of private providers (Bossert et al, 1998). Secondly it is open to biases since the accuracy of recording utilization data may vary in different areas. It is, however, a widely used statistic that allows comparisons over time and among countries (ibid).

This study showed that decentralization of financing in Colombia and Chile certainly did not increase inequality of resource allocations. In Colombia, decentralization significantly improved equity of intergovernmental transfers compared with the historical system, which favored the richer municipalities. In Chile, transfers remained relatively equal throughout the 3–7 years after full implementation of decentralization. Equity seems to have been achieved through a significant increase in available national funding that was distributed to reduce the gap between rich and poor rather than through a redistribution of resources from the rich to the poor (ibid).

The literature reviewed above has shown that the use of needs based formulae can result in the allocation of resources according to need, provided the components of the formula can measure need accurately. It also highlighted that there are a variety of variables that can be used to measure need and all of them have different pros and cons. It is therefore difficult to get variables that can measure need appropriately. This problem is magnified in the developing country context where the required skills and data is limited. Deprivation indices have been used in resource allocation formulae (McIntyre et al, 2000). Studies have shown that there is a correlation between ill health and deprivation. Measures of deprivation can therefore be used to assess the levels of ill health and hence need. Resources can then be allocated according to need. Their use in a developing country

context would be appropriate because they can be constructed from the available limited data sources. Secondly they are a little bit less sophisticated to use than some of the formulae used in the developing countries. This study therefore advocates for the use of deprivation indices in resource allocation formulae.

### **2.5.1 Measurement of Deprivation**

There is no definitive method of how to measure deprivation. Several methods that have been used to measure deprivation combine a number of socio-economic and demographic variables into a composite index of deprivation. What differentiates the indices is usually their component variables, and whether the variables are weighted equally or differentially to form a composite index (HEU, 2003). The variables that are usually required in the construction of an index of deprivation include demographic variables age, gender, socio economic variables specific to the individual, socio-economic variables that apply to a household and health status indicators (HEU, 2003). Indices can also comprise of just a single variable (Campbell, 1991; McIntyre et al, 2000). The advantages with a single variable are that it is simpler to calculate and easier to update. The disadvantage is that it is more susceptible to rapid changes or fluctuations than a composite index (McIntyre et al, 2000).

The variables that are commonly included in deprivation indices in high income countries include low social class, unemployment, socio-economic grouping facilities, children under 5, pensioners living alone, belonging to a minority group, mobility, lack of ownership of a car, single parent, living in rented accommodation, lack of amenities and lack of educational qualities. Experience in the middle and low income countries has been limited, however the indices used usually include illiteracy, lack of access to running water, lack of access to electricity, lack of access to sanitation/sewerage, low quality housing, overcrowding, unemployment, age, lack of assets/durable household goods, gender and geographic area (HEU, 2003). According to McIntyre et al (2000), indices of deprivation will vary depending on the variables that are included. The selection of variables for an index should be guided by the policy goals of the study, the purpose for which the index is being derived as well as the geographical location where the phenomenon in question is to be identified (Taylor, 1998). When investigating equity in health care resource allocation, the choice of variables could reflect policy makers or community's views about what should influence resource allocation. It can also come from relationships identified in the socio-economic and health data (McIntyre et al, 2000).

An index may be created simply by finding the average value from a number of variables, which the researcher is interested in. The disadvantage with this method however is that variables with lower weights are under represented (McIntyre et al, 2000). An unweighted index can also be created by adding scores assigned to individual variables (ibid). The problem with this however is that an assumption is made that all variables have the same weight and therefore an individual with one characteristic has the same chance of being in need or being deprived just like another individual with another characteristic (Gordon 1995; (Folwell, 1995). To cater for this, it is now generally agreed that an index should be additive. Which means that individuals with more of the variables should be more likely to be in need or to be deprived than those with fewer variables (Gordon, 1995). Weighting of indexes is also preferred because it allows expression of the relative importance of each of the variables in producing the outcome of interest (McIntyre et al, 2000). The problem with weighting however is how to determine the weights. This can be solved by using principle component analysis to derive the index. In this technique the weights are statistically determined by their relative contribution to the generated index.

The review of the literature has highlighted many different issues that will guide the study. The next section provides a summary of these issues.

- In the context of this dissertation equity refers to fairness and justice in the distribution of resources. The poor suffer a heavy burden of illness and yet they often receive a lower amount of resources than those who are better off. This often results in inequities in health outcomes. In order to address these inequities, resources need to be allocated relative to the needs of the population. This is in line with the principle of vertical equity, which will be the perspective that the study will take.
- Efficiency and Equity considerations are both important in the allocation of resources. Any additional resources that are distributed to the districts should be used efficiently. This study therefore advocates for resources to be allocated in a manner that allows maximum health benefits to be obtained, while ensuring an optimum mix of inputs for the delivery of services.
- This study acknowledges that both distributional justice, which focuses on the distribution of health outcomes across individuals and groups within society and procedural justice, which emphasizes fairness with respect to processes (such as access and financing) are important with regard to resource allocation processes.

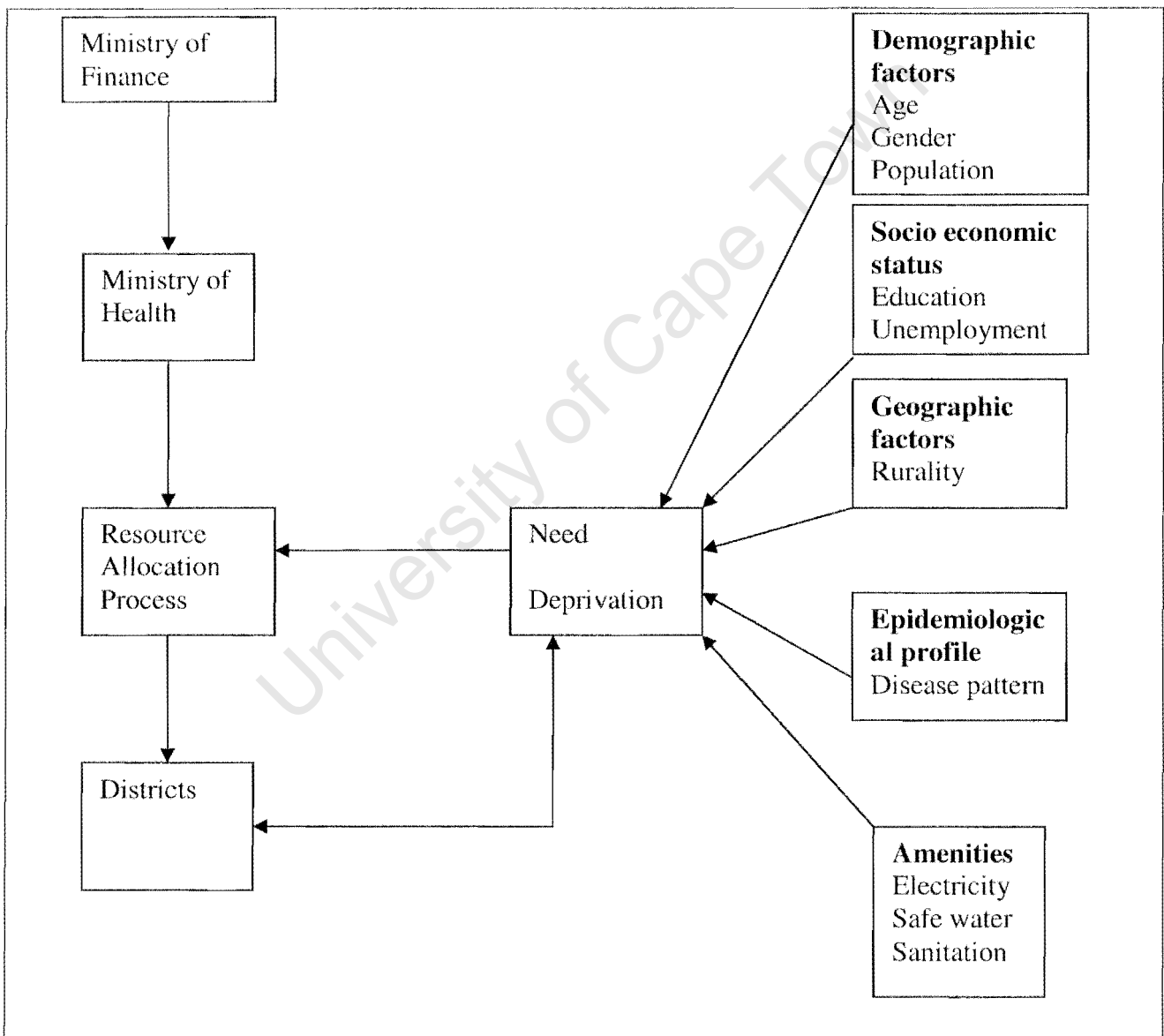
- Ideological perspectives influence the nature of a society's health system and affects the distribution of health care resources. The Egalitarian and Marxist theory's favour health systems where services are distributed according to need and financed according to ability to pay. This is in line with the vertical equity perspective taken by this study which seeks to enhance the well being of all members of the society by encouraging the allocation of resources according to need.
- The normative definition of need will be used in this study. 'Health need' will be measured using an index that includes variables reflecting socio-economic and demographic characteristics.
- Several approaches have been used to allocate resources. Some of them are based on historical methods and tend to perpetuate existing inequities. Currently there is a shift towards the use of needs based resource allocation formulae, which often result in a more equitable distribution of resources. The formulae used in different countries vary in complexity according to the individual components. This study is advocating for the use of a resource allocation formula that incorporates a deprivation index as a measure of need. It has been shown that there is a correlation between ill health and deprivation. Measures of deprivation can thus be used to assess the levels of ill health and therefore need. Resources can then be allocated according to the identified need. Their use in a developing country context would be appropriate because of the limited data sources and skills.

# Chapter Three

## 3.0 Conceptual Framework

The conceptual framework for this study focuses on factors that influence the allocation of financial resources to the district by influencing the level of need in the districts. Figure 3.1 provides a diagrammatic presentation of the framework.

Fig 3.1 Conceptual framework for the study



Resources for primary health care are allocated to the districts by the Ministry of finance. The amounts to be allocated are determined using a resource allocation formula that takes into

consideration issues such as health needs of the district, wealth of the district and the amount of donor contributions in the form of projects.

There are variations in need among districts in Uganda, such that some districts have more need than others. The level of need in districts are influenced by other factors. Low socioeconomic status has been associated with ill health. Material deprivation will subject people to poor living conditions evidenced by lack of access to amenities such as safe water, electricity, and toilet facilities. All these factors will predispose them to poor health and therefore they will have more health care needs than those who are better off. The very young and very old have greater health needs than the general population. Similarly women have greater health needs than men. The diseases prevalent in the area will also affect the amount of need. Geographic factors also influence the social services that are available to the community, and this eventually affects their social economic status and their health status. In Uganda for example those living in rural areas don't have access to good education, employment, health facilities etc. This manifests itself in the poor indicators that are prevalent in the rural areas compared to the urban areas. Areas with very high populations are also bound to have more need.

It is difficult to measure need directly. Proxy measures such as age categories, gender categories, population size, socio-economic status are often used. In this study the need in the various districts will be measured using variables that will comprise an index that will measure need. Studies have shown that those who are more deprived tend to suffer ill health more than those who are less deprived. An index of deprivation will therefore be constructed and used to measure need. Variables that measure material deprivation and social deprivation will be used to construct the index. This will be done using principal component analysis. The deprivation index will then be used to construct a resource allocation formula that will be used to assess the extent of vertical equity that exists in the allocation of resources in Uganda. If the allocation process is meeting its equity objectives then it should be channelling resources to the districts according to the level of need.

# Chapter Four

## 4.0 Methods

### 4.1 Study Design

The study was a cross-sectional analytic study with qualitative and quantitative methods of data collection. Secondary data was reviewed in all the 56 districts of Uganda<sup>9</sup>. Uganda was chosen because it is the country of origin for the principle investigator; secondly it uses a needs based formula for the allocation of PHC grants to the districts.

### 4.2 Data Collection Methods and Techniques

The data was collected using three main methods. These included key informant interviews, review of secondary data and review of documents about resource allocation. The key informant interviews were used to collect information about the resource allocation formula and the resource allocation process used for the allocation of PHC grants to the districts in Uganda. Semi structured questionnaires were used to capture the information. The interviews were also recorded on a tape.

Secondary data was used to collect information on demographic and household characteristics, malaria statistics and expenditure on PHC. The information on the sociodemographic characteristics and household characteristics was obtained from the 2002 census compiled by the Uganda Bureau of Statistics. The census data was used because it has a variety of demographic and socio economic variables, and a large sample size which would make the findings representative of the districts in the country. Secondary data on the recurrent expenditure on PHC was obtained from the Ministry of Health and Finance. This was restricted to the PHC grants<sup>10</sup> allocated to the districts in the financial years 2002/2003, 2003/2004, and 2004/2005. Data was obtained on both the planned allocations, and the actual allocations. The information was captured on spread sheets. Data on the prevalence of malaria was obtained from the Ministry of Health. Documents about the resource allocation formula for PHC grants and the resource allocation process for the health sector were also reviewed.

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<sup>9</sup> The data used in this study was from the 2002 census. By then Uganda consisted of 56 districts. By the time the study was done in 2006, the number of districts had increased to 79.

<sup>10</sup> Only PHC recurrent ( non wage) grants will be considered because they are allocated to all the districts using a resource allocation formula this will enhance comparison between districts.

## **4.3 Data Management and Analysis**

### **4.3.1 Analysis of Qualitative Data on Resource Allocation**

The qualitative data obtained from the key informant interviews was transcribed. Thereafter the information obtained from the transcribed interview and the notes were reconciled to ensure that all relevant information had been captured. Thematic and content analysis was used to analyse the data. The principle investigator read through the notes several times in order to become conversant with them. The arising themes and categories from the interviews about the use of the resource allocation formula were then obtained. These qualitative results are presented to reflect these themes and categories using text in the results.

### **4.3.2 Assessing Equity in the Allocation of PHC Grants.**

The quantitative data collected was edited to identify mistakes and missing information was collected. It was then entered into an excel spreadsheet. A detailed description of the analysis for each of the objectives is given in the sections that follow.

The assessment of equity in the allocation of PHC grants involved the construction of a deprivation index, which was compared with the per capita expenditure on PHC. The sections that follow provide a detailed description of how this was done.

#### Construction of the Deprivation Index.

Principal components analysis was used to generate a deprivation index. PCA is a statistical technique that reduces a set of variables to a smaller subset of variables (components), which reflect underlying processes that have created the correlations among variables. In this study, the aim is to generate only one component, which should reflect the underlying process (deprivation) that creates the correlation among the chosen variables. The process of construction of the index involved several steps as explained below.

- The first step involved identification of the socio-economic, demographic and health variables that are indicators of material and social deprivation. The variables that were identified are presented in table 4.1.

Table 4.1 Variables identified for inclusion in the deprivation index

No	Variable name	Variables
1.	No education	Proportion of the district population above 18 years with no education
2.	Illiterate	Proportion of the district population above 10 years that is illiterate
3.	No employment	Proportion of the district population that is unemployed
4.	Roofs	Proportion of households in the district with low quality roofing materials
5.	Walls	Proportion of households in the district with low quality wall materials
6.	Floors	Proportion of households in the district with low quality floor materials
7.	No elec/lighting	Proportion of households in the district with no electricity for lighting
8.	Firewood	Proportion of households in the district that use firewood for cooking
9.	No piped water	Proportion of households in the district that do not have access to piped water
10.	No safe water	Proportion of households in the district that do not have access to piped water or borehole water.
11.	No Toilet	Proportion of households in the district that do not have access to any kind of toilet facility
12.	No flush Toilet	Proportion of households in the district that do not have access to flush toilets.
13.	No Flush/VIP	Proportion of households in the district that do not have access to a flush toilet or ventilated pit (VIP) latrine
14.	Dist HF	Proportion of the population in the district that lives more than 5km from a health facility
15.	CH below 5	Proportion of children below 5 in the district
16.	Elderly	Proportion of the population that is 65 years and above in the district
17.	Rural Pop	Proportion of the district population residing in rural areas
18.	Prop Mal	Proportion of the population in the district who suffered from malaria in 2002
19.	Female	Proportion of the district population who are female
20.	Women rep	Proportion of females in the district who are in their reproductive age (15-49)

These variables were chosen because they include some of the variables that have been included before in deprivation indexes in low-income countries (McIntyre et al, 2000; Semali et al, 2005). Secondly they include some of the priority areas for the health sector in Uganda and thirdly the data is available in the census results and the health management information system. Most of this information is also captured in the national household surveys that are held every 2-3 years therefore the index can be updated.

#### Proportion of the population with no education and the proportion that is illiterate

It is known that those who are educated are usually less deprived and often have better health promotive behavior and health seeking behavior than those who have no education, or who are illiterate. A district with the majority of its population not having received any education may therefore have a higher prevalence of many of the communicable and non-communicable diseases. This may translate into higher costs and therefore more need for such districts.

#### Proportion of the population with no employment

Lack of employment results in people having a low socioeconomic status, which has been associated with more ill health.

#### Proportion of the population with poor quality housing

The quality of housing is often indicative of a person's socioeconomic status. People with a lower level of socio economic status often have poor housing. They are also prone to having ill health as a result of poor ventilation and overcrowding. The data available could not allow the assessment of the quality of housing as one variable because it was in a disaggregated form; therefore three different variables were used. These included low quality roofing materials (grass, papyrus, tins, banana leaves), low quality wall materials (mud and unburnt bricks) and low quality floor materials (rammed earth, poor quality wood).

#### Proportion of households that do not use electricity for lighting.

Lack of access to electricity for lighting is indicative of material deprivation and has been used as a measure of deprivation in previous studies.

#### Proportion of households that use firewood for cooking

Use of firewood for cooking in Uganda is indicative of material deprivation. It can also predispose the population to respiratory tract infections especially when used in poorly ventilated premises. In other studies lack of electricity or gas for cooking has been used as a measure of deprivation. This was not considered appropriate for the Ugandan context, where even people with a fairly high social status tend not to use electricity for cooking because the charges for electricity are very high instead they use gas and charcoal.

#### Proportion of households with no access to piped water and safe water

Lack of access to safe water can predispose the population to diseases such as diarrhoea, cholera, and typhoid. In Uganda the ministry of water and sanitation considers access to safe water to

include access to piped water, borehole water and water from protected springs and wells. However, the use of protected springs and wells was not considered a source of safe water in this study, because sometimes the protection has been poorly done such that the water gets contaminated.

#### Proportion of households with no access to a flush toilet or VIP<sup>11</sup> latrine

A number of the communicable diseases are associated with poor waste disposal so it is one of the areas of focus in the UNMHCP. In this study unsafe waste disposal included the use of all other types of toilet facilities other than the flush toilet and the ventilated pit latrine (VIP). In Uganda the ministry of water and sanitation considers the use of VIP's an acceptable means of waste disposal. Secondly the coverage for flush toilets is very low.

#### Proportion of the population residing in rural areas

More resources are required to provide health services in rural areas. A higher percentage of the poor who usually suffer a heavier burden of ill health also live in the rural areas.

#### Proportion of households who live more than 5 km from the health facility

Communities with a large proportion of the population living more than 5km from a health facility are usually disadvantaged because they cannot access health services easily. They are often also located in very rural places or hard to reach areas with poor terrain, water bodies etc. Such districts therefore require more resources to cater for the needs of such populations.

#### Proportion of children below 5 years

Children below 5 are prone to suffering from communicable diseases. They also require services such as immunization, growth monitoring. A high population of children would therefore translate to higher costs.

#### Proportion of the population over 65 years

Elderly people are prone to chronic diseases and take longer to recover from illnesses than the younger people. In studies in developed countries, the cut off point has been 75 however because in low-income countries our life expectancy is lower (47) for Uganda. A cut off point of 65 years was used because the proportion who may survive up to 75 is likely to be small. Secondly it was

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<sup>11</sup> A Ventilated pit (VIP) latrine is a latrine that has been constructed with an air vent

not made very close to 47, because at that age one may not experience all the problems that elderly people are prone to.

#### Proportion of the population who suffered from malaria .

Malaria is one of the leading causes of morbidity and mortality in Uganda; it is exceeded only by perinatal and maternal conditions. The latter conditions could not be included in the index because of lack of reliable data.

#### Proportion of the population that is female.

Females have been known to have more health care needs than men. A district with more females may therefore, have more need and therefore require more resources. Women aged 15-49 have additional needs associated with their reproduction.

- These variables were prepared for analysis by expressing them as proportions in relation to the underlying population of relevance to that variable. (For example, proportion of the district population living in rural areas = population of the district population living in rural areas/ Total district population).
- The next step was to identify the sub-set of variables that are correlated with each other to include in the PCA analysis, by doing a correlation analysis of all variables. This was achieved by doing the product moments correlation. When constructing a single index the variables included need to correlate with each other since the aim is to measure the underlying process that is closely associated with the variation observed in these variables. Correlation co - efficients of between 0.5 and 1 are usually regarded as strong correlations; hence a correlation of 0.6 with a significance level of 1% was used as the cut off point for this study.

Some variables that had been considered for inclusion in the deprivation index were therefore excluded from the PCA. These included firstly, the proportion of households who live more than 5 km from a health facility, with poor quality floor and wall materials, with no access to safe water, no toilets and flush toilets. Secondly, the proportion of the population below 5 years and over 65 years, the proportion of the population aged 18 and above with no education, aged 10 and above that is illiterate, the proportion who suffered from malaria in 2002 and the proportion of females and women in their reproductive ages. All of them were primarily left out because they did not correlate with each other. Secondly when the distribution of the variables across the districts is almost uniform then it is not necessary to include it as an indicator of need. This was the case for some of the variables that were excluded (Proportion of females, Proportion of the population

above 65 years, children below 5, women of reproductive age). Their contribution to need would be captured by the population size of the district.

The elderly are more prone to chronic diseases and therefore require more health care resources. However, it has been found that in developing countries it is often age below 5, which is important and not age above 75. Furthermore since the life expectancy in Uganda is low (47), the proportion of the population who survive up to 65 years are not likely to be large enough to result in a variation across districts that would significantly affect need.

The proportion of the population who suffered a malaria episode was also excluded partly because it is based on utilization data and therefore it may not reflect true need. Table 4.2 indicates the variables that were finally included in the PCA.

Table 4.2 Variables included in the PCA

No	Variable name	Variables
1	No employment	Proportion of the district population that is unemployed
2	Floors	Proportion of households in the district with low quality floor materials
3	No elec/lighting	Proportion of households in the district with no electricity for lighting
4	Firewood	Proportion of households in the district that use firewood for cooking
5	No piped water	Proportion of households in the district that do not have access to piped water
6	No Flush/VIP	Proportion of households in the district that do not have access to a flush toilet or ventilated pit (VIP) latrine
7	Rural Pop	Proportion of the district population residing in rural areas

- The variables were then examined again to ensure that all those selected were additive. To ensure that the variables included are additive implies that areas with say, a high proportion of the population without access to safe water and a high proportion of the population with poor toilet facilities are worse off (more deprived) than areas with only a high proportion of the population without access to safe water. This was also necessary to avoid double counting, a situation that occurs when two variables that measure the same phenomenon are included.
- The PCA was then run using the STATA soft ware package. The PCA component I which explained the largest proportion of the variance of included variables is the one that was chosen.
- To calculate the final index, the component score coefficients are multiplied with the standard scores (Z scores) for each of the variables that contributed significantly to the

component. The component score coefficients and Z scores are generated automatically by stata. The weighted variables were then added up to produce an index of deprivation.

#### Comparison of the Per Capita Expenditure and Deprivation.

To assess the extent of vertical equity that exists in the resource allocation process for PHC grants, the per capita PHC expenditure was compared with the index of deprivation. This would aid in assessing whether the resources are actually allocated according to the level of deprivation. This was done for the planned and the actual allocations for PHC for the financial years 2002/2003, 2003/2004 and 2004/2005. The results were then presented as a line graph.

Regression analysis was then done with the deprivation index as the independent variable and the per capita expenditure as the dependent variable. This was done for the planned and the actual allocations for PHC for the financial years 2002/2003, 2003/2004 and 2004/2005. A significance level of 5% was used to assess if there was any significant relationship between the per capita expenditures and the deprivation indices.

#### **4.3.3 Deriving a Resource Allocation Formula.**

##### Measurement of deprivation

The normalized deprivation index was used to measure the levels of deprivation in the various districts. The deprivation index which was obtained as explained in section 4.3.2 was normalized by adding 15.1756 to each of the values obtained for the deprivation index. This resulted in the least deprived district which initially had a value of -14.1756 now having a value of 1 as shown below.

Normalised deprivation Index (I) = Deprivation index ( -14.1756) + 15.1756

The different districts were then divided into 5 quintiles according to their normalized deprivation indices, with levels of deprivation increasing across the quintiles. The districts in quintile 1 therefore have the least deprivation while quintile 5 has the districts that are most deprived.

##### Deriving the Resource Allocation Formula

In needs based resource allocation formulae, the size of the population in each geographic area is the primary indicator of need for health services used. In a study done in South Africa, (McIntyre et al, 2002) a General index of deprivation (GID) was derived. This index was then used to construct a resource allocation formula. It was normalised, then weighted by the provincial

population and used to obtain a percentage share of the weighted population, which was incorporated into the provincial resource allocation formula that was used to determine the amount of resources that should have been allocated to each province. The same methodology is used in this study to construct a resource allocation formula.

The formula was obtained by weighting the deprivation index by population. The normalised deprivation index was used to weight the population. This was done by multiplying the population of each district by the districts normalised deprivation index as shown below.

Normalised deprivation index  $\times$  population of the district = weighted population

Each districts percentage share of the weighted population was then calculated. This was done by dividing the weighted population of the district by the sum of the weighted populations for all the districts, and then multiplying by 100. This is illustrated below.

% percentage share of the weighted population =  $\frac{\text{Weighted population of district}}{\text{Sum of the weighted population of all districts}} \times 100$

The percentage share of the weighted population for each district was multiplied by the total amount of resources available in the budget in order to calculate the equity target share of resources for the district.

Equity Target share = % share of weighted population  $\times$  total budget to be allocated

This equity target share is the amount that should be allocated to the district using this formula.

#### 4.4 Quality Control

To ensure the quality of the study, the following measures were taken.

- Editing and cleaning of the data was done.
- Data for the variables used in the study were obtained from the census, which is representative of the population in the different districts of Uganda.
- All variables used were highly correlated with each other
- PCA was used for weighting the variables.

- Key informant interviews were tape-recorded and later transcribed to minimize loss of information.

#### **4.5 Ethical Considerations**

Ethical approval to conduct the study was sought from the University of Cape Town Research Ethics Committee and the Uganda National Council of Science and Technology. Permission to obtain information about resource allocation and utilization of health services was obtained from the officers responsible at the Ministries of finance and health, and the Uganda Bureau of Statistics. I also obtained informed consent from all the key informants who were interviewed. The names of those interviewed are kept anonymous.

University of Cape Town

## Chapter 5

### 5.0 Results

In the results section, results of both the qualitative and quantitative aspects of the study are presented. The first part will include a description of the resource allocation formula used for the allocation of the recurrent PHC grants in Uganda. This will aid in understanding the process of resource allocation and its effects on the equitable allocation of resources. The subsequent parts will look at how the deprivation index was constructed and used to identify the districts with greatest disadvantage. The final sections of the results will show how the degree of equity in the present resource allocation formula was assessed and how a resource allocation formula was derived.

### 5.1 Description of the Resource Allocation Formula for Uganda

#### The Resource Allocation Formula for Recurrent PHC grants

Financial resources are allocated by the Ministry of Finance with guidance from the cabinet. The health sector first assesses the health needs of the country and then prepares a plan showing the priority areas of the health sector. This is done in collaboration with various stakeholders from the different ministries, districts, and NGO'S. The plan is guided by the health sector strategic plan. This plan is costed and made to fit within the projected resource envelop for the health sector provided by the Ministry of Finance.

The funds sent to the districts for the running of the primary health care activities is sent under a conditional grant and it is allocated using a resource allocation formula. The formula has 5 broad components. These include health needs, project funding, the poverty level of the district, presence of IDP camps and cross border flows (considered in the population inflator) and the population that is not served by the district and regional hospitals. When these components are being assessed the following variables are taken into consideration; the population of the districts, the population of children below five, the population density, the burden of disease index, the size of the district, the poverty level in the district, the infant mortality rate, contributions by donors in the form of projects, presence of endemic diseases, bad terrain for example in Karamoja and Bundibugyo and the presence of internally displaced populations.

Members of staff from the health financing team in the department of planning in the ministry of health score the components listed above, giving each a score ranging from 1 to 10. Each of the team members is responsible for scoring a certain number of districts. After they have given their scores, other members of the team also score the district and an average score is obtained for each component. During the scoring process they consider the variables mentioned above. For example when scoring health needs, they would consider issues such as the infant mortality of the districts, the proportion of children below 5, the presence of endemic diseases, and the terrain. To assess the contributions by donors they consider the number and size of projects in the district. The scores are then translated into a poverty inflator, population inflator, hospital inflator, health needs inflator and a project inflator. In each case the inflators are scaled to between 0.9 and 1.1.

An overall adjustment factor is then obtained by multiplying each of these inflators as indicated below.

Overall adjustment factor = poverty inflator x population inflator x project inflator x hospital inflator x health needs inflator.

The population of the district is then weighted by the overall adjustment factor. This is done by multiplying the district population by the overall adjustment factor. This weighted population is then used to obtain the share of resources that should be allocated to the districts by multiplying it with the total budget available for allocation and then dividing it by the total weighted population for the country.

$$\frac{\text{Weighted Population}}{\text{Sum of weighted population}} \times \text{Total budget available} = \text{District budget}$$

Sum of weighted population

Table 5.1 provides an illustration of how the resources would be calculated for a few districts followed by a detailed description of how each of the inflators is obtained. The total budget available for allocation was 23,160,000,000 Uganda shillings and the total weighted population was 24,600,014.

Table 5.1 Resource allocation formula for Uganda

Dist	District Pop	Poverty inflator	Pop inflator	Project inflator	Health needs inflator	Hospital inflator	Overall adjustment factor	Weighted Pop	District budget
Adju mani	201493	1.04	1.040	0.95	1.08	0.97	1.07642	216891	204194825
Apac	676244	1.04	1.010	0.96	1.06	0.96	1.0264543	693914	653294272
Arua	855055	1.04	1.023	0.92	1.06	0.94	0.9762026	833918	785102840

Source Department of Planning Ministry of Health

### Poverty inflator

The poverty inflator is calculated using the figures for the poverty index for each of the districts. The poverty index is obtained from the household consumption figures produced by the ministry of finance. The formula used to obtain the poverty inflator is indicated below.

Table 5.2 Calculation of the poverty inflator

District	Poverty index	Poverty inflator $1.1 - \text{Poverty index}/500$
Adjumani	30.2	1.04
Apac	27.7	1.04
Arua	30.6	1.04

### Population inflator

A score representing the extent to which the district is affected by cross border flows and the presence of internally displaced people (IDP) is given by the different members. Then an average score is obtained. The percentage of the average score is then added to 1 to obtain the population inflator.

Table 5.3 Calculation of the population inflator

District	Score for influence of cross border flows and IDP's						Average	Population Inflator ( $1 + Av\%$ )
	SB	RB	GM	CK	SL	CM		
Adjumani	4		6	5	1		4.000	1.040
Apac	0		1	2	0	2	1.000	1.010
Arua	2	2	4	4	0	2	2.333	1.023

### Hospital inflator

District hospitals and regional hospitals receive funds for PHC activities separate from those provided for the PHC recurrent activities for the district. The proportion of the population who receive services from them is therefore subtracted when PHC funds are being allocated. This is catered for by the hospital inflator. To obtain the hospital inflator, each of the members of the team gives a score representing the estimated proportion of people who use services from the district and the regional hospitals. An average score is then obtained and then the percentage of this average score is subtracted from 1.

Table 5.4 Calculation of the hospital inflator

District	Reg hospital	District hospital	Score for estimated prop of pop using reg and dist hosp services for PHC						Average	Hospital inflator (1-AV%)
			SB	RB	GM	CK	SL	CM		
Adjumani		1			5	10	5		6.67	0.97
Apac		2			10	10	5		8.33	0.96
Arua	1	2			10	20	5		11.67	0.94

#### Health needs inflator

This inflator is used to cater for the special health needs of the district. It is obtained by adding the percentage of the average score obtained for the special health needs of the district to 1.

Table 5.5 Calculation of the health needs inflator

District	Score for special health needs				Average	Health Needs inflator (1+ Av%)
	SB	GM	CK	RB		
Adjumani		7	8	8	7.67	1.08
Apac	7	5	6	5	5.75	1.06
Arua	5	6	7	6	6.00	1.06

#### Project inflator

The project inflator is obtained by giving a score for the estimated project funding in the district and then subtracting the average score divided by 100 from one. This caters for the fact that some districts may receive more funding from projects than others.

Table 5.6 Calculation of the project inflator

District	Score for project funding in District				Average	Project inflator 1- Av/100
	SB	GM	CK	RB		
Adjumani		5	5	5	5.00	0.95
Apac		4	4	4	4.00	0.96
Arua		8	8	8	8.00	0.92

The quotations below, obtained during interviews with key informants from the Ministry of Health affirm the above findings.

*“We have a formula that helps us allocate resources to the district. It includes the population of the district, burden of disease index, size of the district, infant mortality rate. We consider also the poverty level of the district. Some seem to be a little ahead of others, when it comes to general development, so using this formula the district gets the amount it deserves.” K.I MOH*

*“The allocations are made using a combination of incremental budgeting and the resource allocation formula. Some of the factors that we consider also include the number of health facilities in the district, the distance of the district from Kampala. Some districts are far so their costs are higher, presence of endemic diseases.” K.I MOH*

#### Sources of data for the components in the formula

Some of the parameters are calculated from surveys that are held in the Country. For example the population figures are obtained from the results of the census, which also provides population projections for the subsequent years. The infant mortality rate is obtained from the results of the Uganda Demographic Health Survey that is held every five years. The household consumption figures used in the poverty index is provided by the ministry of Finance Planning and Economic Development. However some of the parameters are determined subjectively by staff in the department of planning. The quotations below illustrate these findings.

*“The population figures are from the census results. The infant mortality rate from the Uganda Demographic and Health Survey. The last one was in 2000, and the next one was last year, the results are about to come out.” K.I MOH*

*“Yes some of course we use experience to predict them. Using people who are well versed with that area in the department. You say how big that problem is and make intellectual guesses.” K.I MOH*

*“The scoring is done by members of the health financing team. Each person is responsible for a certain number of districts. After an individual has made his scores, he is asked to defend it and then the rest of the members also score the district and an average is obtained.” K.I MOH*

### Allocation of Resources to the lower level units

There is a formula that guides the allocation of resources to the lower level units. Ten percent of the resources are supposed to be spent to the DDHS's office. This reflects an increase from 5% and this is because the operational costs have increased. Fifty percent is supposed to be spent on drugs. The balance of 40% is allocated to the lower level units. However the district is now being given more freedom in deciding how to allocate the resources especially the balance of the PHC grants to the lower level units. This is to be done using guidelines that were prepared through a joint effort by the Ministry of health staff and the District officials.

### Degree of Equity Achieved Using the Formula

The current allocation formula is considered equitable. This is supported by the quotation below.

*“Yes it was developed to be equitable. These are the factors, which bring equity. If we are talking about poverty, population, children under 5, size, local problems including internally displaced people we are talking about equity.”*K.I MOH

However it was also noted that when it comes to the actual application of the formula to allocate resources, sometimes lobbying by influential people, influences the degree of equity achieved.

*“Ah equity yes! From our formula yes! But in reality no. The reality is that we have external factors that come into play as funds are realised causing some distortions. The local society can appeal that, “your Excellency this is how we are being treated!” So he can easily say no this is not acceptable. Ministry of health can you find money to fix A, B and C. And that is what restrains the budgeting system because now our formula is being directed.”* K.I MOH

*“ Sometimes it is difficult to use the formula because we are instructed not to give the districts less money than they got the previous year.”* K.I MOH

The resource allocation formula is supposed to be reviewed regularly at least every year. However because some of the issues are relatively constant this is not done. The amount of money allocated to the districts is therefore allocated using a combination of historical budgeting with increments in allocation each subsequent year when the budget is increased. The districts tend to get an amount similar to what they have got previously.

*“Yes we are supposed to review it every year. Ideally it should be every year, but sometimes the problems are almost the same, money is almost the same.”* K.I MOH

The officials interviewed felt that the formula is satisfactory as it is at the moment.

*“Of course there are many things which people want to see in the formula and they are endless. People come up with many ideas and you can’t incorporate all of them. So we have considered the main ones.”* K.I MOH

#### Constraints Faced in Using the Formula

There are some challenges that are faced in the allocation of resources using the formula. One of the main ones is the fact that the available resources are not sufficient for meeting the needs in the districts. So there are always complaints from the districts about the allocated resources. This is compounded by the high population growth rate of the country and an increase in morbidity and mortality from diseases such as TB, HIV, malaria, which is not matched by an increase in resources. These results are supported by the quotations below.

*“High population growth, we have 1 million children arriving every year and this exerts pressure on the existing social services. Diseases like malaria, TB, AIDS have all been demanding more resources from the sector.”* K.I MOH

Inflation and rising operational costs also have an effect on the budget, making it even less. To make matters worse, the local governments no longer collect taxes, which were used to supplement some of the operational costs in the past, so they are entirely reliant on the money from the center.

*“Of course challenges are there the money is not enough. Inflation eats up some of it. You talk of 20 billion next year which is not the same as 20 billion this year. We have things like fuel. The prices are going up. This has a bearing on our operations. You find that local governments no longer collect taxes<sup>12</sup> so we can’t expect them to contribute towards health and they depend largely on the money sent from the center and that is a challenge”* K.I MOH

A high turn over of staff who have been trained to use the formula both at the center and in the districts was seen to be compromising proper implementation of the formula.

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<sup>12</sup> Local governments no longer collect graduated tax because during the election campaigns the president issued a directive that graduated tax should be terminated.

*Turn over in the system is another issue. Including at the center. You train people to allocate resources, and then somebody may leave to look for another Job. So you find you are training people continuously.” K.I MOH*

Since the districts are now operating under a decentralized system, when they get support from donors they can construct more health units. However the donors usually do not cater for the operational costs of the units. So this increase in the number of infrastructure is not matched by an increase in resources and therefore it complicates the use of the formula. They allocate the resources with a certain number of units in mind and then there is an increase in the number of units during the year. This means the available resources must be divided between even more units and spread even thinner. This problem was expressed by one of the key informants as noted below.

*“You allocate resources but they have built more units. Three more units means more operational funds, more drugs. So when you build another unit you need more resources.” K.I MOH*

Donors contribute resources to districts differently. This can lead to inequity if some districts receive more resources than others. In addition, it is not easy to get a complete record of all the resources spent by the donors in the respective districts. This therefore affects their incorporation into the resource allocation formula.

*“Regarding contributions from donors, sometimes we can tell how much some of them contribute, because we are involved. But in some cases it is difficult to quantify how much they are giving. But we are telling the districts to record all this money. So it’s not easy to capture everything but the idea is to capture everything and then plan accordingly.” K.I MOH*

When planning and budgeting for the health sector, the ministry of finance guides the ministry of health as to how much money, they should plan for. However sometimes even this planned money eventually does not materialise.

*“When we are doing a budget, we may come up with definite figures that have to go to the districts. But we never realise 100% of what we give to the districts. The ministry of finance may say we do not have the money. Our development partners also are not consistent. They may pledge a certain amount of money at the beginning of the year but towards the end of the year, you find that some have not sent in this money.” K.I MOH*

The differences between the actual allocations and the planned allocations which are made using the resource allocation formula, for Uganda were obtained by subtracting the planned allocation from the actual allocation. The results are shown in table 5.7 for the ten most deprived districts and the 10 least deprived districts. Results for all the districts is presented in Appendix 3.

Table 5.7 Differences between the actual and planned allocations of the PHC grants for the financial years 2002/3, 2003/4 and 2004/5 for the 10 least deprived and the 10 most deprived districts.

District	Deprivation index	Diff between actual and planned PHC grants 2002/3	Diff between actual and planned PHC grants 2003/4	Diff between actual and planned PHC grants 2004/5
<b>Least deprived</b>				
Kampala	1	-16977958	278491403	-240160000
Wakiso	8.98059	-18682461	525697479	-406623939
Jinja	9.95844	-10820096	-203116310	27036000
Kalangala	12.58548	-3281307	-103975703	126233000
Mukono	13.26014	-26708769	337178379	-242788000
Masaka	13.96508	-22614844	518222368	-470630000
Kasese	14.26957	-9875221	302119025	86352000
Luwero	14.39637	136599369	165332104	-31518000
Gulu	14.53222	-167137928	70831167	-51849018
Nakasongola	14.63109	-4086506	-158149804	183373000
<b>Most deprived</b>				
Kapchorwa	16.42426	-5775998	56276830	-99120000
Pallisa	16.45483	-12092967	245146434	-193607000
Kumi	16.4896	-8439846	-90035739	156980000
Kotido	16.54579	23817791	160150969	-107682000
Yumbe	16.71069	-3480026	-351727901	386809000
Nebbi	16.74784	-10154137	289625633	-215497000
Katakwi	16.76880	-8168968	121374099	-282839000
Pader	16.79681	-6763976	-66180003	80492000
Apac	16.85008	-14346879	324750346	-263763000
Kaberamaido	16.87036	-4242140	-84354668	91137000

In summary the key informant interviews revealed that the resource allocation process for PHC recurrent grants combines the use of a resource allocation formula and incremental budgeting. The formula has 5 broad components (health needs, project funding, the poverty level of the district, presence of IDP camps and cross border flows (considered in the population inflator) and the population that is not served by the district and regional hospitals) which are weighted by the district population. Some of the components of the formula are measured using objective means while others are measured subjectively (as a results of lack of the required information). Challenges that are faced in using the formula to allocate resources include a high turn over of staff who have been trained to use the formula both at the center and in the districts, a continuous increase in need which is not matched by an increase in the amount of resources available,

increases in the number of infrastructure which is not matched by an increase in resources for recurrent expenditure, lobbying by influential persons and incomplete recording of donor resources to the districts.

## 5.2 Deprivation index

To construct the deprivation index, variables that have been used to measure deprivation in other studies, as well as other variables which were considered important from the policy perspective of Uganda were included. The variables were then correlated. Results for the entire correlation matrix are shown in table 5.15 in appendix 4. The variables that were highly correlated with each other were chosen. The variables used were correlated at the 1% level with a cut off point of 0.6 for the co-efficient. Generally there is no way to scientifically select the best cut-off point to use. However a cut off point of 0.6 was selected because it would result in the inclusion of only variables that have significantly high levels of correlation with each other. These included

- Poor quality floor materials
- Lack of access to piped water
- Lack of electricity for lighting
- Use of firewood for cooking
- Lack of access to a flush toilet or VIP latrine
- Living in a rural area
- Lack of employment

The results of the correlation for the chosen variables are shown in table 5.8.

Table 5.8 Correlation results for the variables included in the PCA

Variable	Floor	No elec/ Lighting	Firewood	No Piped	No Flush/VIP	No rural Pop	No employment
Floor	1.0000						
No elec/lighting	0.9413 0.0000	1.0000 0.0000					
Firewood	0.9020 0.0000	0.9438 0.0000	1.0000				
No Piped	0.8179 0.0000	0.9112 0.0000	0.8862 0.0000	1.0000			
No Flush/VIP	0.7079 0.0000	0.7135 0.0000	0.8558 0.0000	0.7185 0.0000	1.0000		
No Rural Pop	0.6651 0.0000	0.8079 0.0000	0.8002 0.0000	0.8134 0.0000	0.6370 0.0000	1.0000	
No Employment	0.8004 0.0000	0.7955 0.0000	0.9004 0.0000	0.7192 0.0000	0.9087 0.0000	0.9087 0.0000	1.0000 0.0000

The first component explains 83.5% of total variation of all the variables included in the PCA. These results are presented in Table 5.9.

Table 5.9 Principle component analysis results

Component	Eigenvalue	Difference	Proportion	Cumulative
1	5.84743	5.31549	0.8353	0.8353
2	0.53194	0.18488	0.0760	0.9113
3	0.34706	0.19200	0.0496	0.9609
4	0.15506	0.09466	0.0222	0.9831
5	0.06040	0.02140	0.0086	0.9917
6	0.03900	0.01990	0.0056	0.9973
7	0.01910	0.0027	1.0000	

One component was retained and table 5.10 shows the eigen vectors for this component.

Table 5.10 Eigenvectors for the PCA for the deprivation index

Variable	Component 1
Floor Materials	0.37868
No electricity for lighting	0.39635
Firewood for cooking	0.40725
No piped water	0.37984
No flush/VIP	0.35778
Rural Pop	0.34779
Unemployed	0.37471

The variables included all contributed similarly to the deprivation index.

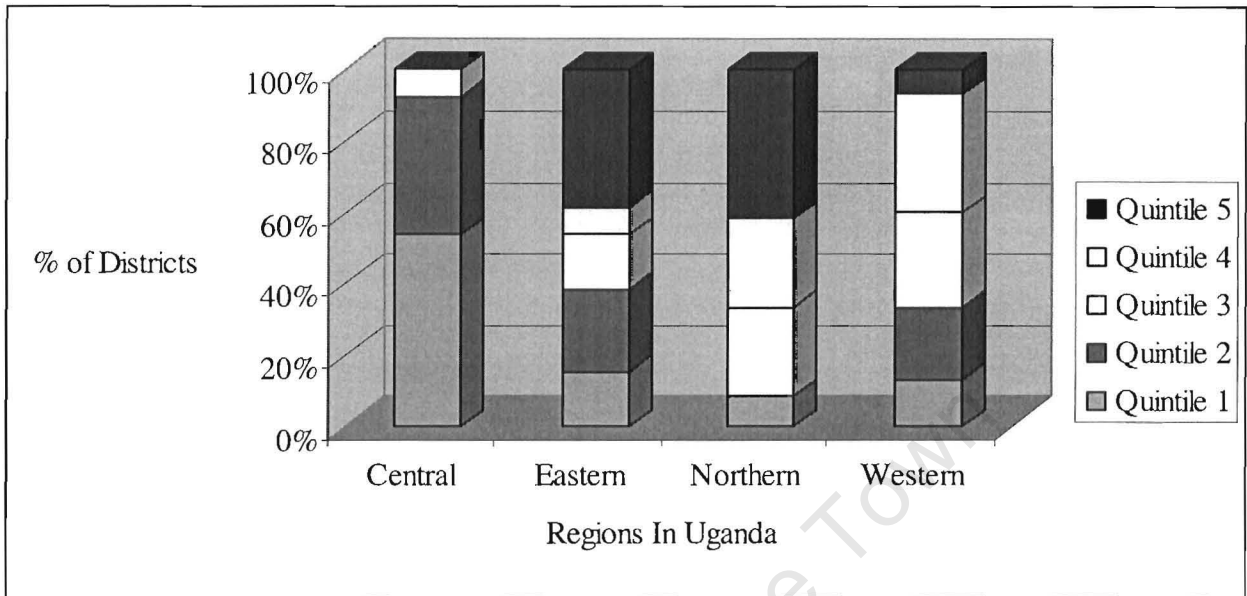
To calculate the deprivation index, the component score coefficients were multiplied with the standard scores (Z scores) for each of the variables that contributed significantly to the component. These weighted variables were then summed up to produce a deprivation index. The score coefficients that were used to construct the index were the same as the scores obtained for the eigen vectors presented above in table 5.8. The contribution by the different variables was very similar, however the variables which contributed most were using firewood for cooking, lack of access to electricity for lighting and lack of access to piped water.

### 5.3 Levels of Deprivation in the Country.

A normalised deprivation index was used to measure the levels of deprivation in the various districts. The different districts were divided into 5 quintiles according to their weighted normalised deprivation index, with levels of deprivation increasing across the quintiles. Quintile 1 represents the districts in the country with the least deprivation while quintile 5 represents the districts with the most deprivation. Figure 5.1 illustrates how deprivation is distributed across the 4

regions of the country (Central, Eastern, Western, and Northern). The levels of deprivation in each of the districts are displayed in appendix 4.

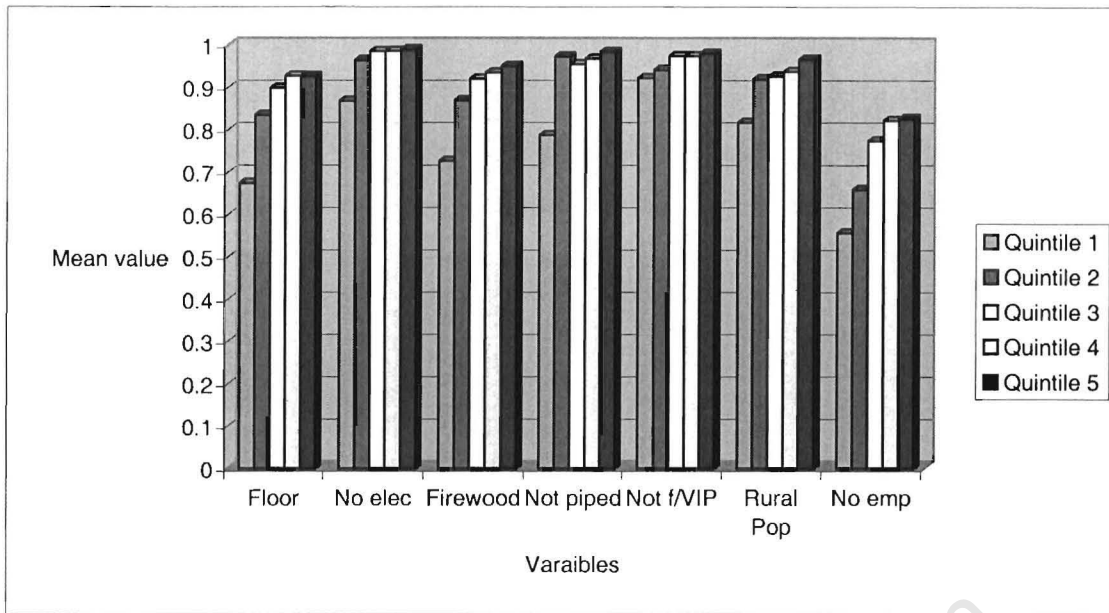
Fig 5.1 Deprivation across regions in Uganda



The region with the highest percentage of districts in quintile 1 (least deprived) was the Central region (53.8%) followed by the Eastern region (15.38 %). While the regions with the highest number of districts in quintile 5 (most deprived) were the Northern region (38.46 %) and the Eastern region (38.46 %). In the Western region the majority of districts were in quintile 3 and 4 (59%).

The distribution of the variables comprising the deprivation index was also explored across the quintiles. The results are presented in fig 5.2.

Fig 5.2 Distribution of variables across the different quintiles



Quintile 1 which had the districts with the least deprivation had the lowest proportions of the population lacking the services in question, while quintile 5 which had the most deprived districts consistently had the highest proportions.

#### 5.4 Extent of vertical Equity in Resource Allocation.

The extent of vertical equity in the resource allocation formula for Uganda was assessed by comparing the planned and actual per capita expenditures for the PHC resources and the normalised deprivation index. This was done for the financial years 2002/2003, 2003/2004 and 2004/2005. The results for the planned per capita expenditure PHC allocations are shown in fig 5.3, 5.4 and fig 5.5.

The linear trend line was inserted so that it can aid in showing the direction of deprivation.

Fig 5.3 Per capita expenditure of planned allocations for PHC in 2002/2003 and deprivation in Uganda.

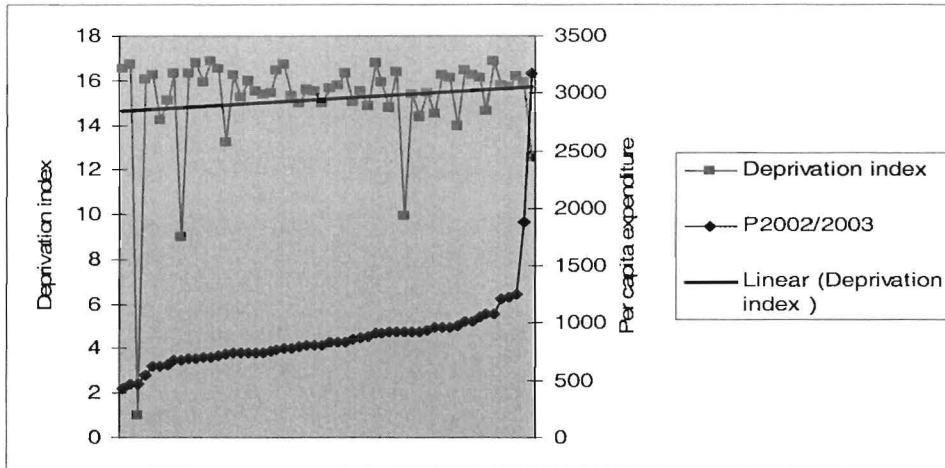


Fig 5.4 Per capita expenditure of planned allocations for PHC in 2003/2004 and deprivation in Uganda

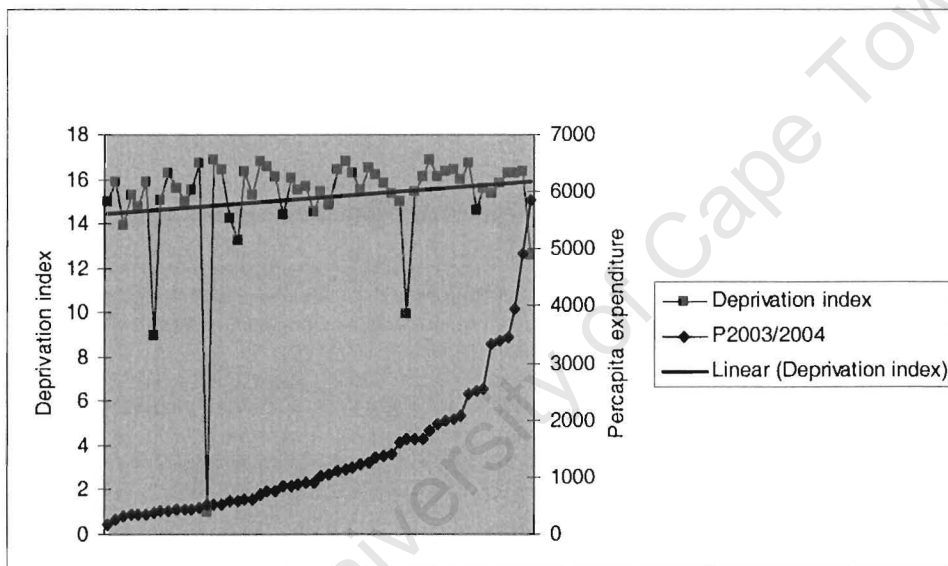
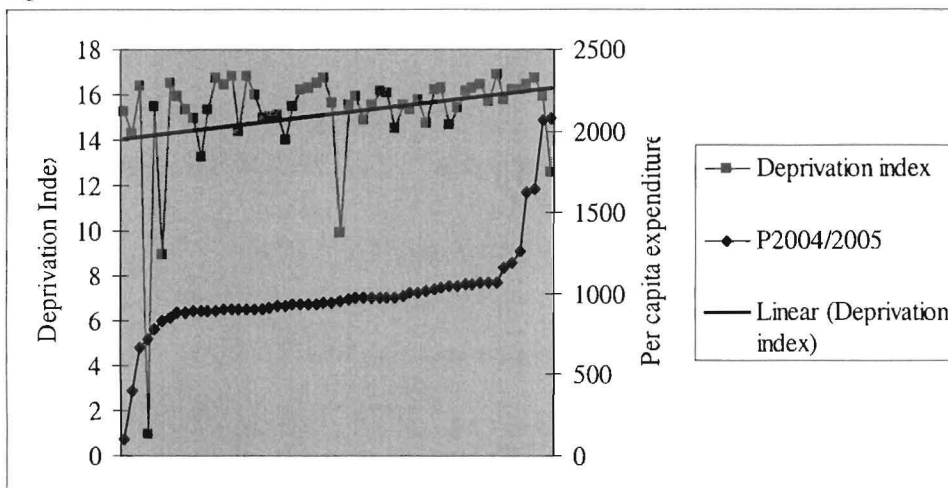


Fig 5.5 Per capita expenditure of planned allocations for PHC in 2004/2005 and deprivation in Uganda



Key: P 2002/2003 Refers to the planned PHC allocations for the specified year.

The graphs indicate that in all the three financial years there was a positive relationship between the PHC per capita expenditure and the level of deprivation. As the deprivation index increases (more deprived and therefore higher needs), the per capita expenditure also increased. Figure 5.6, 5.7 and 5.8 display the results for the comparison of the actual PHC allocations and the deprivation index.

Fig 5.6 Per capita expenditure of actual allocations for PHC in 2002/03 and deprivation in Uganda

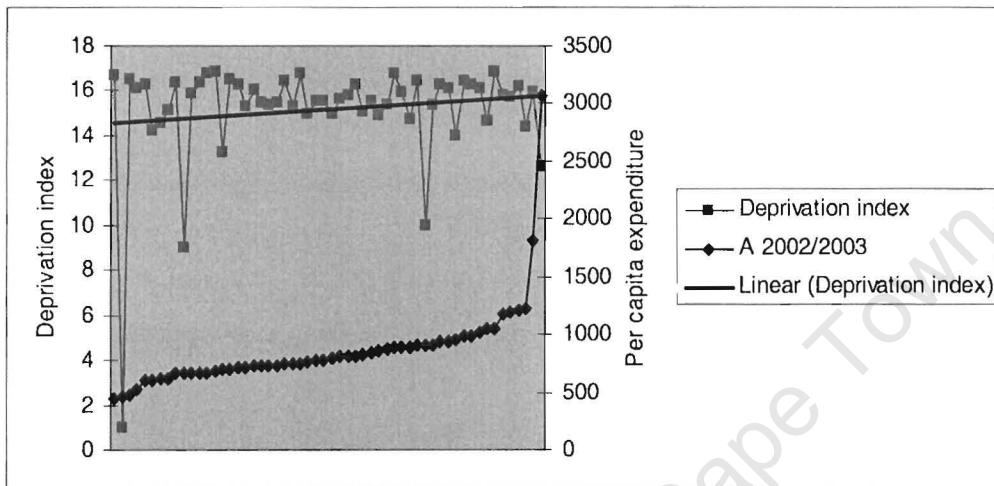


Fig 5.7 Per capita expenditure of actual allocations for PHC in 2003/04 and deprivation in Uganda

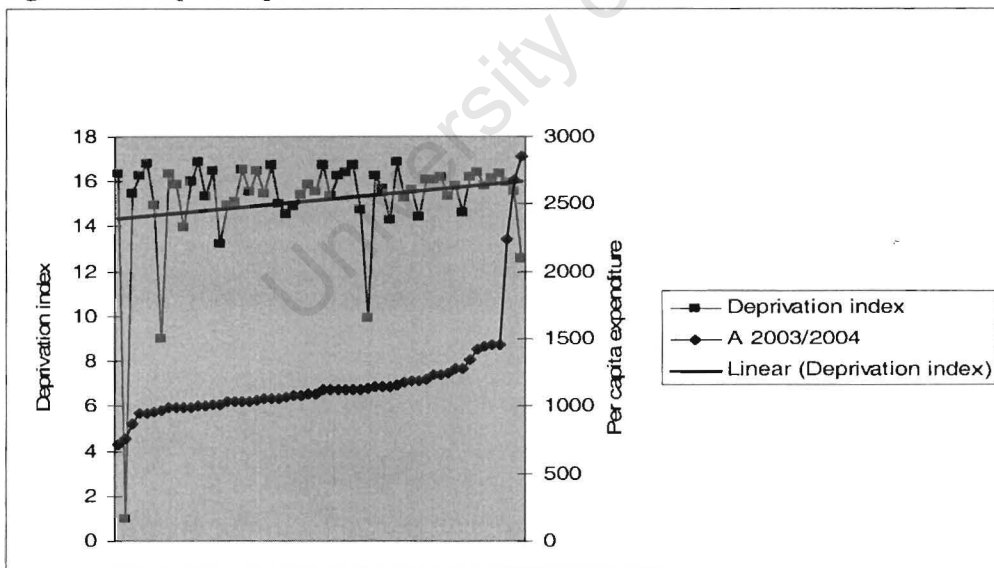
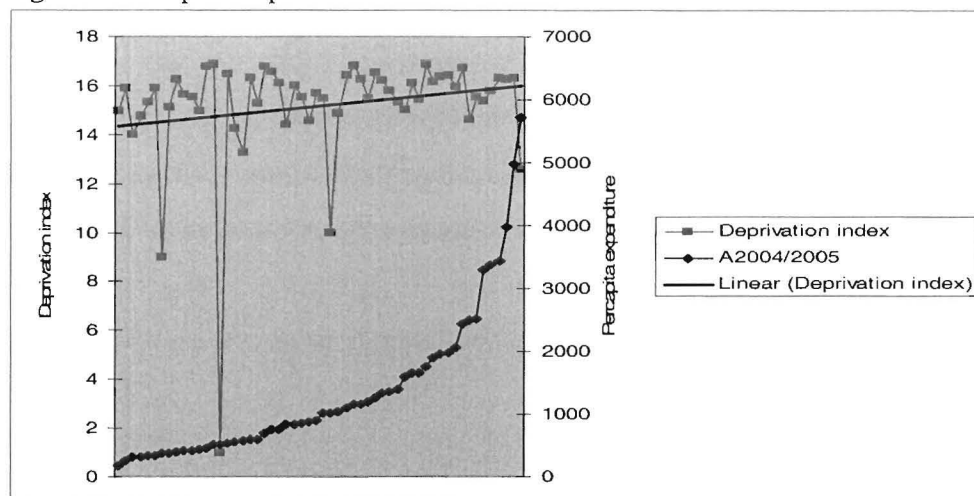


Fig 5.8 Per capita expenditure of actual allocations for PHC in 2004/05 and deprivation in Uganda



Key: A2002/2003 Refers to the actual PHC allocations for the specified year.

The graphs for the actual per capita expenditure are similar to those that were obtained for the actual planned expenditure. In all three financial years there was a positive relationship between the deprivation index and the per capita PHC expenditure. Showing that the index of deprivation and the per capita expenditure changed in the same direction.

Regression Analysis of the Per capita Expenditure and the Deprivation Index.

Regression analysis was applied to provide a more rigorous explanation of the relationship between the deprivation index and PHC per capita expenditure. In each of the regression models, the deprivation index is the independent variable and the per capita PHC expenditure the dependent variable. This was done for the planned and the actual allocations for PHC for the financial years 2002/2003, 2003/2004 and 2004/2005. A significance level of 5% was used to assess if there was any significant relationship between the per capita expenditures and the allocations.

Table 5.11 Regressions of the deprivation index and the planned PHC per capita expenditures (2002/3, 2003/4 and 2004/5)

Regression	2002/2003	2003/2004	2004/2005
Co efficient for Deprivation index	- 1.172055	41.45299	15.9197
P>t	0.957	0.538	0.343
R <sup>2</sup>	0.0001	0.0071	0.0167

The p value for the coefficient of the deprivation index shows that the deprivation index was not significant in all the three financial years ( $> 0.05$ ), indicating that there is no significant relationship between the deprivation index and the PHC per capita expenditure for all the three financial years. The relationship between the deprivation index and the PHC per capita expenditure in 2002/2003 was negative. Indicating that as the deprivation index increased the per capita expenditure decreased. The  $R^2$  values obtained in all three cases is also very small indicating no significant association between the two variables. These results show that the PHC expenditures are not allocated according to the deprivation levels of the district.

Table 5.12 Regressions of the deprivation index and the actual PHC per capita expenditures (2002/3, 2003/4 and 2004/5).

Regression	2002/2003	2003/2004	2004/2005
Co efficient for Deprivation index	-1.002273	10.06191	52.18199
P>t	0.962	0.633	0.435
$R^2$	0.0000	0.0043	0.0113

The results obtained when the actual allocations were regressed with the deprivation index are similar to what was obtained with the planned allocations. It showed no significant relationship between the deprivation index and the actual per capita expenditure for all the three financial years, judging from the values for the r squared and the p values ( $>0.05$ ) for the deprivation index coefficient. This means that the allocation of PHC resources is not done according to need in Uganda.

## 5.5 Resource Allocation Formula

A resource allocation formula was constructed by weighting the deprivation index by population. A detailed description of the method used was given in the methods section. The population was weighted by the normalized deprivation index to obtain the weighted population. Each districts' percentage share of the weighted population was then calculated. This was done by dividing the weighted population of each district, by the sum of all the weighted populations of the districts, and then multiplying this figure by 100. The equity target share of resources for the district which is the amount that should be allocated to the district using this formula was obtained by

multiplying the percentage share of each district by the total amount of resources available in the budget.

To assess the differences between the allocations made using the Ugandan resource allocation formula and the one derived from this study, the PHC allocations for 2004/2005 were then subtracted from the equity target shares. Table 5.13 illustrates the figures obtained for the planned PHC allocations among the 10 least deprived districts and the 10 most deprived districts. A full list of the allocations to all the districts is provided in appendix 5.

Table 5.13 Comparison of equity target shares and the planned PHC allocations (2004/5) to the 10 least deprived and 10 most deprived districts

District	Normalised Index	District Pop	Weighted Pop	% Share of weighted Population	Equity Target Share	PHC grant 2004/2005	Difference
<b>Least Deprived Districts</b>							
Kampala	1.00000	1187795	1187795	0.33459	76090500	857495000	-781404500
Wakiso	8.98059	907736	8152007	2.29638	522219965	753712939	-231492974
Jinja	9.95843	387249	3856394	1.08632	247041743	369995000	-122953257
Kalangala	12.58548	34699	436703.4	0.12301	27975351	72158000	-44182648
Mukono	13.26014	795114	10543323	2.97000	675408396	709189000	-33780604
Masaka	13.96508	770379	10758402	3.03059	689186427	713908000	-24721573
Kasese	14.26957	522726	7459077	2.10118	477830673	209116000	268714673
Luwero	14.39637	478492	6888546	1.94047	441282322	432420000	8862322
Gulu	14.53222	475071	6903837	1.94478	442261867	466683018	-24421150
Nakasongola	14.63109	127048	1858850	0.52363	119078507	133030000	-13951493
<b>Most Deprived Districts</b>							
Kapchorwa	16.42426	190282	3125241	0.88036	200203868	308791000	-108587132
Pallisa	16.45483	520532	8565268	2.41279	548693586	469541000	79152586
Kumi	16.48960	389599	6424330	1.80970	411544468	334551000	76993467
Kotido	16.54579	591870	9792957	2.75863	627339751	556899000	70440750
Yumbe	16.71069	251758	4207050	1.18510	269504896	226207000	43297896
Nebbi	16.74784	435252	7289531	2.05342	466969509	412374000	54595508
Katakwi	16.76880	298900	5012193	1.41191	321082597	491829000	-170746403
Pader	16.79681	326320	5481136	1.54401	351123199	295647000	55476199
Apac	16.85008	683987	11525234	3.24660	738309928	617708000	120601928
Kaberamaido	16.87036	131627	2220595	0.625532	142251983	141460000	791983.274

The differences between the planned allocation according to the Ugandan resource allocation formula and the equity target shares were very large (millions of Uganda shillings). According to the Ugandan resource allocation formula, 8 out of the 10 districts which were least deprived would have received more resources than they should actually have received according to the equity target shares. This indicates that the formula is allocating more resources to some of the districts

which are less deprived. Similarly 8 out of 10 of the districts which were most deprived, and which should have received more resources would have received less resources. This indicates that the formula is allocating less resources to some of the districts which are more deprived.

Table 5.14 illustrates the figures obtained for the actual PHC allocations among the ten least deprived districts and the ten most deprived districts. A full list of the allocations to all the districts is provided in appendix 6.

Table 5.14 Comparison of equity target shares and the actual PHC allocations to the 10 least deprived and the 10 most deprived districts (2004/5).

District	Dep Index	District Pop	Weighted Pop	% Share weighted Pop	Equity Target Share	PHC grant 2004/2005	Difference
<b>Least Deprived Districts</b>							
Kampala	1.00000	1187795	1187795	0.33459	75783076	617335000	-541551923
Wakiso	8.98059	907736	8152007	2.29638	520110070	347089000	173021070
Jinja	9.95843	387249	3856394	1.08632	246043635	397031000	-150987364
Kalangala	12.58548	34699	436703.4	0.12301	27862324	198391000	-170528675
Mukono	13.26014	795114	10543323	2.97000	672679583	466401000	206278583
Masaka	13.96508	770379	10758402	3.03059	686401948	243278000	443123947
Kasese	14.26957	522726	7459077	2.10119	475900122	295468000	180432122
Luwero	14.39637	478492	6888546	1.94047	439499435	400902000	38597435
Gulu	14.53222	475071	6903837	1.94478	440475023	414834000	25641022
Nakasongola	14.63109	127048	1858850	0.52363	118597401	316403000	-197805599
<b>Most Deprived Districts</b>							
Kapchorwa	16.42426	190282	3125241	0.88036	199394996	209671000	-10276003
Pallisa	16.45483	520532	8565268	2.41279	546476732	275934000	270542732
Kumi	16.48960	389599	6424330	1.80970	409881729	491531000	-81649271
Kotido	16.54579	591870	9792957	2.75863	624805147	449217000	175588146
Yumbe	16.71069	251758	4207050	1.18510	268416032	613016000	-344599968
Nebbi	16.74784	435252	7289531	2.05342	465082840	196877000	268205839
Katakwi	16.76880	298900	5012193	1.41191	319785346	208990000	110795346
Pader	16.79681	326320	5481136	1.54401	349704577	376139000	-26434423
Apac	16.85008	683987	11525234	3.24660	735326978	353945000	381381977
Kaberamaido	16.87036	131627	2220595	0.62553	141677251	232597000	-90919749

The results obtained with the actual allocations are similar to what was obtained with the planned allocations. The differences between the two allocations are still very large. According to the actual allocations, 4 out of 10 of the least deprived districts received more resources than they should have. On the other hand 5 out of 10 of the most deprived districts received less resources than they should have. This indicates that the formula is allocating more resources to some of the districts, which are less deprived and less resources to some of the districts which are more deprived.

# Chapter Six

## 6.0 Discussion, Conclusions and Recommendations

The discussion has two main sections. The first section will focus on the levels of deprivation in Uganda. The second section will focus on the degree of equity achieved in using the formula and issues surrounding the use of the formula.

### 6.1 Deprivation in Uganda

The central region had the districts with the least deprivation with the majority of the districts in quintile 1 and quintile 2 while the Northern region had the districts with the greatest deprivation with the majority of the districts in the 5<sup>th</sup> and 4<sup>th</sup> quintile.

One of the reasons why the central region had the least deprivation may be because there is more economic activity in the central region of the country. This has enabled the population in this area to obtain higher levels of income. By 1999- 2000, 26% of those in the rural central region were classified as poor compared to 62% of those in the rural northern areas (Appleton et al, 2003). The population in the central region is therefore less susceptible to material and social deprivation. A number of districts in the Northern part of the country on the other hand have suffered from civil strife for the past 18 years. This has affected the economic activity and employment opportunities in the area. Provision of basic services has also been affected. This is worse for the districts where a large percentage of the population live in camps<sup>13</sup>. They are thus more prone to being in a state of deprivation compared to the other regions of the country.

The variables used in this study to measure deprivation were quite different from those that are commonly used in high income countries, which commonly comprise of low social class, unemployment, socio-economic grouping facilities, children under 5, pensioners living alone, belonging to a minority group, mobility, lack of ownership of a car, single parent, living in rented accommodation, lack of amenities and lack of educational qualities. They were however similar to variables that have been used in other low income countries such as South Africa and Tanzania (Semali et al, 2005; McIntyre et al, 2000).

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<sup>13</sup> Part of the population live in camps because of the poor security situation.

## 6.2 Equity in the Allocation of PHC Resources

A comparison between the per capita expenditure on PHC and the deprivation index implied a positive relationship between the two variables (fig 5.3 to fig 5.8). It is important to note however that the positive relationship seen in the graphs did not indicate that the PHC resource allocation was done according to need. When a more rigorous explanation of the two variables was done by applying regression analysis, the results did not reveal a significant association between the per capita expenditure on PHC and the deprivation index for all the 3 financial years. This indicated that there was no significant relationship between need and the amount of PHC recurrent resources allocated to the districts. These findings are similar to what Rocha et al (2004) found in North Eastern Mexico, where the degree of equity was measured according to the degree of agreement between the position of the DMMA with respect to health needs and its position in per capita health expenditures. The results showed that the allocation of financial resources was not in accordance with the needs.

When allocations determined by the equity target shares obtained using the formula constructed from the deprivation index were compared with allocations according to the Ugandan resource allocation formula the differences obtained were very large in almost all cases (Millions of Uganda shillings). Some of the districts which were less deprived had been allocated more resources, while some of the more deprived districts had received less resources. This contrasts what was found by Semali et al (2005) in Tanzania where the difference in resource allocation between the poverty based formula and the equity target shares calculated in the study were only slight.

Considering the vertical equity perspective which advocates for more resources to be allocated to areas with more need, the excess amount of resources allocated to those who were less deprived should have been given to the more deprived districts. Assuming these more deprived districts had the capacity to benefit from the increased allocations this would have resulted in the society receiving greater benefits from the money. Such an allocation would also be in line with the Egalitarian and Marxist theories of social justice which encourage equal net welfare for all individuals by the allocation of resources according to the differential needs of the society.

The findings highlighted above indicate that the allocation process for PHC in Uganda does not result in the allocation of resources according to need. The proxies that are generally used to measure need in resource allocation formulae include population size, age and sex profiles of populations, health status indicators such as morbidity and mortality and socioeconomic indicators

such as income, employment levels and housing (Pearson 2000; Diderichsen, 2004; Reagon et al, 1997). In addition issues such as cross border flows, differential costs, differing sources of funding, population on medical aid are often taken into consideration (Pearson 2000; Reagon et al, 1997). The Ugandan formula takes into consideration poverty levels, special health needs, the population of the district (including cross border flows and presence of people in IDP camps), donor funding and the population not using hospital services ( Regional and District) for PHC. These components would be expected to result in the allocation of resources according to need; however the results indicate that they do not. This could be due to several reasons.

Resource allocation according to health care needs may be done judgmentally (based on subjective assessment of needs) or statistically (based on more objective indicators of need). Many low income countries use a combination of both (Pearson, 2000). The Ugandan resource allocation formula uses both judgmental and statistical methods; however the larger part of the assessment is judgmental. Some of the factors that are considered such as the special health needs of the district, amount of project funding, proportion of the population using the PHC services, cross border flows, population of internally displaced persons, are assessed based on the scores provided by members of the finance committee. These scores are usually informed by the available data, however this data is often incomplete and lacking in some cases. This kind of measurement is likely to be less accurate than when more objective methods are used to measure indicators of need. Hence it can affect the accuracy with which the formula is able to measure need and to subsequently allocate resources according to need.

For this kind of method to work successfully, it requires experienced personnel who are well versed with the local context of the districts. The turn over of staff should therefore be low since new staff are not likely to have the experience required. In Uganda a high turn over of staff at the center and the districts was noted to be a constraint. This therefore presents problems in using the formula effectively. This could be countered by continuous training. In a country with scarce resources such as Uganda however, this is not always possible.

Lack of reliable data also makes it difficult to update the components of the formula for each of the districts regularly. In the case of Uganda this would mean scoring the different components every year. Since this is done subjectively, the estimates would be unlikely to change significantly. In the case where more objective methods of measurement are used, it is easier to update the formula. This kind of scenario therefore affects the proper use of the formula and encourages reliance on a more historical based system.

Although the formula exists, a degree of incremental budgeting is also incorporated into the resource allocation process. Such that every year more resources are added to the districts according to the availability of funds and the formula is not actually being updated and recalculated every year to allocate the resources for recurrent PHC. These incremental amounts are influenced by factors which may not be uniform in all the districts, such as new health facilities, differing costs, security situation. This has implications as far as achieving equity in resource allocation is concerned. In districts where the original budgets were not allocated according to need, the existing inequities in resource allocation are likely to persist.

Such a system is also more open to manipulation by influential persons. In the key informant interviews it was reported that such lobbying affected the use of the formula. The officials at the ministry are sometimes told that they should not allocate less resources than they allocated to the districts the previous year or they are directed to allocate more resources to certain districts for specific reasons. This results in a situation where it is difficult to achieve equity using a resource allocation formula. In this kind of situation, districts which have people to lobby for them would benefit, while those who do not would suffer. If the districts benefiting have high levels of deprivation then more equity is achieved. On the other hand, where the district is not deprived the end result is more inequity. Some of the districts in Northern Uganda have benefited from this lobbying. This however does not mean that the additional resources that they have been given was commensurate with the need in the area. To determine a reliable formula is still required.

Another constraint is the fact that the resources allocated to the health sector, and for PHC are limited and yet the needs of the districts keep on increasing. For example new facilities are built every year, the growth rate is high so the population keeps increasing, and diseases such as Tb, HIV/AIDS, malaria have been on the rise. When the resources are not increasing at the same rate with the needs it becomes very difficult to use the formula to allocate resources equitably.

Some of the donors in the country contribute their resources directly to the districts in the form of projects. At the moment there is no reliable data base that provides complete information on the number of projects in each of the districts or the amount of money contributed. This therefore makes it difficult to include these contributions in the formula. Furthermore the distribution of individual projects to the districts is often determined by factors that may not allow a systematic distribution. This may lead to inequities, because some districts with relatively lower needs may end up receiving more resources than other districts with relatively higher needs.

All the reasons given above may therefore contribute to the resource allocation formula not resulting in the equitable allocation of resources. There are situations however in some districts in Uganda that may warrant the allocation of more resources to some of the areas that appear to have less deprivation. Districts that have large urban centres such as Kampala and Jinja seemed to be receiving more than their equity target share of resources. However this may be partly because their urban setting makes them unique. The population of such districts during the day is also much higher than what is reported in the census, because there are people from the neighbouring districts who are employed there and they only come to work then go back to their districts of origin. However they tend to use the social services (e.g. medical care) at their place of work. Thus even if the factors are weighted by population it does not reflect such people. Secondly, they tend to have pockets of deprivation. There is often, a high population of people living in slums and leading a lifestyle of crime, prostitution, drug abuse. Such lifestyles predispose them to more ill health and they therefore tend to strain the existing services. Such issues may not be captured by the formula and yet they must be catered for. New districts also tended to be given more resources because their operational costs are expected to be higher than for the other districts since they are just getting established.

Equity in the allocation of PHC in Uganda is important for several reasons. The primary mode of service delivery in the country uses the PHC approach. This means that the provision of preventive services, basic health care services and specialist services are all dependent on the PHC resources. The equitable distribution of these resources is therefore very important in determining access to services. This will aid in reducing the inequities to health service delivery that currently exist in the country.

Secondly, inequities in health outcomes have been observed in the different regions of the country with the Northern region having the worst outcomes. Comparing rural and urban populations in Uganda, those living in the rural areas tend to have poorer health outcomes than the urban population. Similarly, across quintiles the poor have worse health outcomes than the rich (UBOS, 2000). If the allocation of PHC resources is to be fair and just, there has to be a mechanism of identifying these disadvantaged groups so that more resources can be allocated to them.

The Northern part of the country contained the most deprived districts. The prolonged unrest in the region is largely responsible for this situation. The population is more prone to suffering ill health

because of their poor living conditions especially in the camps. The prevalence of diseases such as HIV/AIDS is also reported to be much higher in the camps because the environment tends to favour illicit sex, prevention methods such as condoms are not sufficient, and women are at times forced to offer sex in return for food, not to mention those who are forcefully raped by the rebel soldiers. Such deprived groups need to be allocated preferentially more resources in order to achieve more rapid improvements in their health thereby reducing the inequalities in health (Diderichsen, 2004). According to the results of the study, the most deprived districts at times received less resources than they required, and yet these are the districts that should have received the most resources. Most of the districts in quintile 5 situated in the north had received less resources than they required (comparing with their equity target shares). The government has made an attempt to allocate more resources to the north, however they continue to be the most deprived. This may be because need in the districts is not accurately measured so the government assumes it is giving enough, and yet when compared with the need the resources are insufficient.

Some people may argue however that the donors tend to contribute more resources to disadvantaged populations such as those in the Northern part of the country, such that they end up receiving much higher allocations. This allegation may be true, however these contributions are not adequately quantified, so it has been difficult to assess the amount of the resources contributed by the donors. Therefore it can not be said with certainty that they eliminate the shortages observed in the allocation of resources to the north. It is important for the ministry of health to look for ways of ensuring that such resources are quantified so that this can be taken into consideration during the resource allocation process.

It is not only equity that is important in the allocation of PHC resources. The efficiency with which these resources are used is also important. According to Mooney (2004) the capacity to benefit from additional resources needs to be seriously considered before redistributing resources. The ability of the various districts to use the resources allocated to them efficiently must therefore be assessed. Some remote areas such as Moroto, Kotido may not have the required capacity to utilise these resources in terms of skills and personnel. When more money is allocated to such places it ends up being returned at the end of the financial year. Therefore allocation of additional resources should go hand in hand with the development of capacity to utilise these resources effectively.

Lack of reliable data in the developing countries is one of the reasons why the sophisticated formulae used to allocate resources in the more developed countries are not used. In such contexts,

the use of a deprivation index for resource allocation should be considered. The study has shown that it is possible to measure deprivation even in a country where data is poor using data that is available from surveys such as the census. The indices used in this study are also routinely collected in other countrywide surveys that are done periodically within the country, therefore they can be updated. The problem with these surveys however is that the sample sizes from the districts are usually small and analysis is done at regional level. So the information collected may not be representative at district level, this therefore leaves the census as the only reliable source of information. Although the census is done every ten years it also takes a long time before these variables change significantly. So using the census which gives more representative data may result in more accurate measurement of need.

Much as the deprivation index may be recommended for use in resource allocation formula, it should be noted that its use also has limitations. There are other factors that influence need that may not be captured by a deprivation index. Therefore using this index may not automatically result in an equalisation of need. In such cases it would be necessary to add these variables as separate components to the formula. Secondly needs based formulas are often not used for capital expenditures. Hence, it is necessary to derive other means of allocating these expenditures. It is also important to note that the use of formulas such as the one suggested in this study require skills such as the use of principal components analysis which may not be available in resource poor countries.

The fact that a country has a needs based resource allocation formula therefore does not automatically mean that this formula will result in the allocation of resources to those with more need. The individual components of the formula and the kind of data used to measure these indicators, as well as the weighting given to them, and the actual application of the formula all have a big role to play in determining how equitable the formula will be eventually. It must also be remembered that resource allocation formula are just a guide to the allocation process there are several other factors which must be considered during the allocation process.

In order for the resource allocation process in Uganda to result in the equitable allocation of resources, the formula needs to be the primary determinant for allocating resources. The formula should also be able to identify areas with more need accurately so that more resources can be allocated to them.

### **6.3 Limitations**

It was not possible to access reliable data that could be used for measuring a wide range of health related need such as morbidity due to different illnesses and mortality (especially infant mortality and maternal mortality). Data on morbidity is routinely collected in the health management information system; however this data is often incomplete because of poor reporting by some of the health units. Secondly this data does not capture what happens in the communities since it is facility based. It would therefore not be a true reflection of what is happening in the community. Reporting of deaths in Uganda is not done on a regular basis. Therefore it is difficult to obtain accurate mortality data.

PHC grants in Uganda comprise of PHC recurrent grants, grants for development and for wages. To obtain a full picture of the resources available for primary health care, it would have been necessary to study all the three grants. However only PHC recurrent grants were assessed.

Other sources of funding for primary health care include contributions by donors in the form of projects and out of pocket expenditures. There is no database that provides all the required information on the amount of resources that the donors contribute. So their contribution to PHC services was not assessed. Out of pocket expenditures formed a large part of the expenditure on health in the country (40.5%). This too was not assessed in this study because this information was not readily available.

### **6.4 Conclusions**

A deprivation index was constructed comprising of measures of social and material deprivation and used to measure deprivation. The central region of the country had the least deprivation while the northern district had the most deprivation.

A regression analysis was done to determine if there was a significant relationship between the capita expenditure and the deprivation index. The results showed no significant relationship between the two variables. The planned and actual allocation of PHC resources in the financial years 2002/2003, 2003/2004 and 2004/2005 were also compared with the resources allocated using the formula that was derived in the study. The equity target shares of the districts were compared with the resources allocated to them using the resource allocation formula. The results demonstrated that districts with less need sometimes receive more resources while at times, those

with more need receive less resources. These results illustrate that the resource allocation process is not meeting the vertical equity objective of allocating more resources to areas with more need.

Uganda has a resource allocation formula that is used for the allocation of resources for PHC. Several factors affect the ability of this formula to allocate resources according to need. Lack of reliable data has resulted in the use of judgmental methods in measuring many of the components in the resource allocation formula. This affects the extent to which the formula can accurately measure need. The other constraints include a high turn over of staff, lobbying by influential persons, insufficient funds for PHC and lack of a complete database quantifying donor contributions. The resource allocation formula is used alongside an incremental budgeting system. This has watered down the ability of the formula to result in the equitable distribution of resources.

## **6.5 Recommendations**

The formula for the allocation of PHC grants should be the primary determinant for the allocation of PHC resources in the country. The ministry of health and finance should therefore ensure that the formula is calculated every year and it should be updated regularly. This is likely to result in a more equitable allocation of resources.

The Ugandan formula contains most of the components that a needs based formula should contain, however many of the components are scored subjectively by members of the health policy and planning department. Such measurements are likely to be less accurate and are more open to bias and manipulation. More objective measures should be used to measure all the components included in the formula.

The present allocation formula sometimes results in the districts with less need receiving more resources, and the most deprived districts receiving fewer resources. A deliberate effort should be made by the ministry of health and finance to ensure that this trend is reversed, so that the most deprived districts receive more resources.

In order to allocate more resources to those who have more need, it is necessary to have a way of identifying them. A formula that includes a measure of deprivation such as the one constructed in this study could therefore be used to allocate resources in Uganda.

The resources allocated to the health sector are not sufficient to meet the increasing needs in the sector, the ministry of health should therefore continue to lobby the government to increase the share of funds allocated to the health sector. This will enhance the ability of the ministry of Finance and Health to allocate more resources to places with more need. It is more difficult to reduce resources to places with less need in order to increase resources to places with more need.

Donors still contribute resources directly to the districts through projects. This may result in inequitable distribution of resources across districts. The ministry of health should therefore institute a mechanism of ensuring that the donor projects are equitably distributed among the districts. Secondly the contributions by donors are not adequately quantified. The ministry of health and finance as well as the donor agencies should put in place measures that will ensure that all donor resources to the districts are recorded so that reliable data can be available for use during the resource allocation process.

High turn over of staff was reported to be affecting the use of the formula. The personnel department of the ministry of health should put in place measures that will promote job satisfaction and the motivation of staff in order to counter this problem. Additional training of staff to improve efficiency in the use of resources especially at the peripheral levels should also be taken as a priority by the district health system. The allocation of additional resources to the districts will only be useful if it is accompanied with mechanisms to ensure that the capacity required to use the funds is available in the districts.

External factors which influence the allocation of resources such as lobbying by politicians for districts which are not deprived should be minimised.

The construction of new facilities in the districts should be guided by the central ministry of health. This is important to avoid the excessive stretching of the already scarce resources by distributing them between too many facilities. This may eventually result in poor service delivery in such districts without a net gain in the use of the additional resources.

## **6.6 Further research**

This study used a deprivation index consisting of measures of material and social deprivation to measure need. Such deprivation indices have been used in the allocation of resources. It may be necessary however to include health related measures of need in the formula. These may include

morbidity and mortality measures. The morbidity data and the mortality data collected from the health information management system often reflects facility based figures and does not portray what is in the community. More research about variables that can measure health related need accurately in the Ugandan setting for inclusion into the resource allocation formula is needed.

This research only assessed allocation of PHC resources to the district it did not focus on equity in the allocation of the funds to the lower levels. Since even within districts there exists a variation in need, it is necessary to assess the extent of equity in the allocation of PHC resources to the lower levels within the district.

Improving equity without improving efficiency is not likely to result in an overall benefit for the society. Decentralization in Uganda has put the responsibility of ensuring that resources for PHC are used efficiently in the hands of district managers. Some of the teams may not have the required capacity in terms of skills and numbers. Further research will therefore be helpful in assessing whether the PHC resources are being used efficiently in the districts and in offering solutions to improve this. This will ensure that increased equity in the allocation of resources is matched by efficient use of the additional resources.

A study that will look at the allocation of other types of PHC grants and that will include out of pocket expenditure as well is also recommended. This will form a more complete picture of the resources available for PHC and allow a more comprehensive assessment of the degree of equity.

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## Appendix 1 Questionnaire for key Informant Interviews

1. Could you please explain to me how financial resources for the health sector are allocated to the districts?
2. How are PHC grants allocated? (Probe for information on resource allocation formula, components, weights)
3. Is the resource allocation formulae used? If not why?
4. What are some of the indicators that you think should be included in a needs based resource allocation formula for Uganda and please give reasons for your suggestions.
5. Do you think that the current allocations of PHC grants to the districts is equitable? (By equitable, iam referring to vertical equity, a situation where those with unequal need are treated differently.
6. What are some of the challenges that have been faced in allocating financial resources to the districts equitably?
7. Do you have any suggestions that you would like to make about promoting equity in financial resource allocation to the health sector in Uganda?

## Appendix 2 Consent Form

I am ----- from the University of Cape Town. I am doing a study to find out the extent of equity that exists in the allocation of primary health care resources to the districts. I am therefore interviewing a few key informants to find out about the resource allocation process. The information from this study will be disseminated to stakeholders in the ministry of Health and Finance, so that it can assist them in making decisions about resource allocation to the health sector. There are no risks in your participation in this study. Your name will be kept anonymous. You are free to refuse to participate. If you do agree to participate you are free to refuse to answer any question that I may ask you in the course of the interview. You are free to ask me any questions about the study. Should you wish to contact me, you can do so at the address below.

I would now like to request you to participate in this study, and if you consent, I request you to show that you have consented for the study by signing in the space below. I shall also sign in the space below as a witness to this. You will have a copy of this consent form and I shall also keep one copy.

Interviewer's signature -----

Interviewee's signature -----

Date ----- Place -----

Elizabeth Ekirapa Kiracho

Institute of Public Health Makerere University

P.O.Box 7072

Kampala

Uganda

### Appendix 3 Differences between the actual and planned allocations of the PHC grants for the financial years 2002/3, 2003/4 and 2004/5

Table 5.15 Differences between the actual and planned allocations of the PHC grants for the financial years 2002/3, 2003/4 and 2004/5 for the 10 least deprived districts.

District	Deprivation index	Difference between actual and planned PHC grant 2002/3	Difference between actual and planned PHC grant 2003/4	Difference between actual and planned PHC grant 2004/5
Kampala	1	-16977958	278491403	-240160000
Wakiso	8.98059	-18682461	525697479	-406623939
Jinja	9.95844	-10820096	-203116310	27036000
Kalangala	12.58548	-3281307	-103975703	126233000
Mukono	13.26014	-26708769	337178379	-242788000
Masaka	13.96508	-22614844	518222368	-470630000
Kasese	14.26957	-9875221	302119025	86352000
Luwero	14.39637	136599369	165332104	-31518000
Gulu	14.53222	-167137928	70831167	-51849018
Nakasongola	14.63109	-4086506	-158149804	183373000
Busia	14.75676	-6234494	177342160	-156405000
Kabarole	14.86722	-9544970	7774845	24715000
Mbarara	14.95633	-26556200	852959940	-778888000
Mbale	14.9688	-17074866	429588608	-344356000
Mpigi	15.02125	-16171748	-223680767	278053000
Hoima	15.0991	-6621032	218760417	-183645000
Masindi	15.26213	-10228267	260369266	227500000
Mubende	15.32102	-25056320	461246122	-385005000
Rakai	15.34856	-10582326	-136533481	241072000
Kiboga	15.35171	-6391633	-477340388	527318000
Kayunga	15.42189	-18580670	-173751819	179932000
Soroti	15.46204	-8376603	-62431213	89981000
Iganga	15.48264	-15934377	-113952354	195665000
Mayuge	15.52704	-7879655	53858764	-35577000
Tororo	15.54189	-14135261	353721202	-294196000
Kitgum	15.55658	-6787128	36567793	434068000
Lira	15.62522	-18475140	562027894	-388434000
Kabale	15.68998	-16952782	109112328	-76894000

Table 5.16 Differences between the actual and planned allocations of the PHC grants for the financial years 2002/3, 2003/4 and 2004/5 for the 10 most deprived districts.

District	Deprivation index	Difference between actual and planned PHC grant 2002/3	Difference between actual and planned PHC grant 2003/4	Difference between actual and planned PHC grant 2004/5
RUKUNGIRI	15.80756	-6898705	-26534055	95351000
BUNDIBUGYO	15.81178	-7633978	-410827335	465336000
BUGIRI	15.89565	-13253907	302946677	-259770000
BUSHENYI	15.91472	-20087967	536627180	-465602000
SSEMBABULE	15.93065	-10131557	28220744	-2961000
ARUA	16.00527	-18710610	124097847	-55443000
ADJUMANI	16.08387	-3280801	-90293191	135838000
NTUNGAMO	16.11185	-11081422	163924173	-83920000
KISORO	16.13009	-6952800	-103439058	186848000
NAKAPIRIPIT	16.21126	-5760970	-2292051	20891000
KANUNGU	16.24512	-5953088	-556803022	605760000
KAMULI	16.24744	-15752528	386173428	-611507000
KIBAALE	16.25256	-7612539	-9335527	90556000
MOROTO	16.28621	-5771296	-443333269	455569000
KYENJOJO	16.32190	-9521284	143504786	-128089000
MOYO	16.32550	-3963795	-674794325	762407000
SIRONKO	16.33832	-5831818	-359382005	366506000
KAMWENGE	16.41567	-7330709	-231447693	243112000
KAPCHORWA	16.42426	-5775998	56276830	-99120000
PALLISA	16.45483	-12092967	245146434	-193607000
KUMI	16.48960	-8439846	-90035739	156980000
KOTIDO	16.54579	23817791	160150969	-107682000
YUMBE	16.71069	-3480026	-351727901	386809000
NEBBI	16.74784	-10154137	289625633	-215497000
KATAKWI	16.76880	-8168968	121374099	-282839000
PADER	16.79681	-6763976	-66180003	80492000
APAC	16.85008	-14346879	324750346	-263763000
KABERAMAIDO	16.87036	-4242140	-84354668	91137000

## Appendix 4 Correlation Results for the Variables considered for Inclusion in the PCA

Table 5.17 Correlation results for the variables considered for inclusion in the PCA

	Roof	Walls	Floor	Dist HF	No elec / Lighting	Fire wood	No Piped
Roof	1.0000						
Walls	0.6120	1.0000					
	0.0000						
Floor	0.6437	0.8757	1.0000				
	0.0000	0.0000					
Dist HF	0.3821	0.3345	0.4090	1.0000			
	0.0037	0.0117	0.0017				
No elec / Lighting	0.4853	0.7382	0.9413	0.3975	1.0000		
	0.0002	0.0000	0.0000	0.0024			
Fire wood	0.4139	0.7169	0.9020	0.3687	0.9438	1.0000	
	0.0015	0.0000	0.0000	0.0052	0.0000		
No Piped	0.4684	0.6123	0.8179	0.4856	0.9112	0.8862	1.0000
	0.0003	0.0000	0.0000	0.0001	0.0000	0.0000	
No safe water	0.3032	0.3120	0.2392	0.1311	0.2942	0.3217	0.2678
	0.0231	0.0193	0.0758	0.3357	0.0277	0.0156	0.0460
No toilet	0.7815	0.4474	0.4241	0.5071	0.2933	0.2842	0.3100
	0.0000	0.0005	0.0011	0.0001	0.0282	0.0337	0.0201
No Flush	0.4480	0.5966	0.7203	0.4067	0.7680	0.7802	0.9015
	0.0005	0.0000	0.0000	0.0019	0.0000	0.0000	0.0000
No Flush/ VIP	0.4075	0.5675	0.7079	0.1574	0.7135	0.8558	0.7185
	0.0018	0.0000	0.0000	0.2465	0.0000	0.0000	0.0000
Children below 5	0.2663	0.1416	0.3761	0.2154	0.4346	0.4332	0.4239
	0.0473	0.2979	0.0043	0.1109	0.0008	0.0009	0.0011
Women rep	0.0391	-0.1038	-0.3709	-0.1882	-0.5707	-0.5898	-0.6040
	0.7747	0.4463	0.0049	0.1649	0.0000	0.0000	0.0000
Elderly	-0.3102	-0.0382	0.0712	-0.1125	0.2285	0.3294	0.2832
	0.0200	0.7796	0.6022	0.4090	0.0903	0.0132	0.0344
Female	-0.1211	-0.0569	-0.0690	-0.3591	-0.1101	0.0999	-0.1567
	0.3738	0.6771	0.6134	0.0066	0.4190	0.4639	0.2488
Rural pop	0.2270	0.4552	0.6651	0.2417	0.8079	0.8002	0.8134
	0.0925	0.0004	0.0000	0.0727	0.0000	0.0000	0.0000
Proportion of malaria	0.0250	0.2180	0.1988	-0.3667	0.2075	0.1404	0.0872
	0.8550	0.1065	0.1419	0.0054	0.1248	0.3022	0.5228
No employment	0.4167	0.6243	0.8004	0.1967	0.7955	0.9004	0.7192
	0.0014	0.0000	0.0000	0.1462	0.0000	0.0000	0.0000
Illiterate	0.5894	0.5055	0.5422	0.2901	0.4381	0.4441	0.3681
	0.0000	0.0001	0.0000	0.0301	0.0007	0.0006	0.0053

Table 5.18 Correlation results for the variables considered for inclusion in the PCA

	No safe water	No toilet	No Flush	No Flush/ VIP	Children below 5	Women rep	Elderly
No safe water	1.0000						
No toilet	-0.4036	1.0000					
	0.0020						
No Flush	0.3054	0.2873	1.0000				
	0.0221	0.0318					
No Flush/ VIP	0.1667	0.3107	0.7145	1.0000			
	0.2194	0.0198	0.0000				
Children below 5	-0.0025	0.0912	0.2898	0.4478	1.0000		
	0.9854	0.5037	0.0303	0.0005			
Women rep	-0.2151	0.1306	-0.4165	-0.4600	-0.6834	1.0000	
	0.1114	0.3373	0.0014	0.0004	0.0000		
Elderly	0.3049	-0.2534	0.2340	0.3295	0.4504	-0.7029	1.0000
	0.0223	0.0595	0.0826	0.0132	0.0005	0.0000	
Female	-0.0009	-0.0498	-0.0633	0.4886	0.1948	0.0763	0.2598
	0.9947	0.7153	0.6431	0.0001	0.1503	0.5760	0.0532
Rural pop	0.2926	0.1018	0.7224	0.6370	0.3619	-0.6193	0.3514
	0.0286	0.4554	0.0000	0.0000	0.0061	0.0000	0.0079
Proportion of malaria	-0.0088	-0.1597	0.0184	0.0518	0.0109	-0.1332	0.1473
	0.9485	0.2399	0.8931	0.7048	0.9365	0.3277	0.2786
No employment	0.2373	0.2229	0.6439	0.9087	0.5311	-0.4960	0.3370
	0.0782	0.0988	0.0000	0.0000	0.0000	0.0001	0.0111
Illiterate	-0.2419	0.6919	0.3350	0.4529	-0.0596	0.1652	-0.3234
	0.0724	0.0000	0.0116	0.0005	0.6625	0.2238	0.0151

Table 5.19 Correlation results for the variables considered for inclusion in the PCA

	Female	Rural pop	Proportion of malaria	No employment	Illiterate
Female	1.0000				
Rural pop	-0.0598	1.0000			
	0.6617				
Proportion of malaria	0.0639	0.1670	1.0000		
	0.6400	0.2187			
No employment	0.3987	0.6699	0.1646	1.0000	
	0.0023	0.0000	0.2254		
Illiterate	0.0981	0.2459	-0.1837	0.3575	1.0000
	0.4720	0.0677	0.1754	0.0068	

## Appendix 5 Levels of Deprivation in the Regions

Table 5.20 Levels of deprivation in the Central region

District	Deprivation index	Normalised index	Quintile
Kampala	-14.17560	1	1
Wakiso	-6.19501	8.98059	1
Kalangala	-2.59012	12.58548	1
Mukono	-1.91546	13.26014	1
Masaka	-1.21052	13.96508	1
Luwero	-0.77923	14.39637	1
Nakasongola	-0.54451	14.63109	1
Mpigi	-0.15435	15.02125	2
Mubende	0.14542	15.32102	2
Rakai	0.17296	15.34856	2
Kiboga	0.17611	15.35171	2
Kayunga	0.24629	15.42189	2
Ssembabule	0.75505	15.93065	3

Table 5.21 Levels of deprivation in the Eastern region

District	Deprivation index	Normalised index	Quintile
Jinja	-5.21717	9.95844	1
Busia	-0.41884	14.75676	1
Mbale	-0.20680	14.96880	2
Soroti	0.28644	15.46204	2
Iganga	0.30704	15.48264	2
Tororo	0.36629	15.54189	3
Bugiri	0.72005	15.89565	3
Kamuli	1.07184	16.24744	4
Kapchorwa	1.24866	16.42426	5
Pallisa	1.27923	16.45483	5
Kumi	1.31400	16.48960	5
Katakwi	1.59320	16.76880	5
Kaberamaido	1.69476	16.87036	5

Table 5.22 Levels of deprivation in the Northern region

District	Deprivation index	Normalised index	Quintile
Gulu	-0.64338	14.53222	1
Kitgum	0.38098	15.55658	3
Lira	0.44962	15.62522	3
Arua	0.82967	16.00527	3
Adjumani	0.90827	16.08387	4
Nakapiripirit	1.03566	16.21126	4
Moroto	1.11061	16.28621	4
Moyo	1.14990	16.32550	4
Kotido	1.37019	16.54579	5
Yumbe	1.53509	16.71069	5
Nebbi	1.57224	16.74784	5
Pader	1.62121	16.79681	5
Apac	1.67448	16.85008	5

Table 5.23 Levels of deprivation in the Western region

District	Deprivation index	Normalised index	Quintile
Kasese	-0.90603	14.26957	1
Kabarole	-0.30838	14.86722	1
Mbarara	-0.21927	14.95633	2
Hoima	-0.07650	15.09910	2
Masindi	0.08653	15.26213	2
Kabale	0.51438	15.68998	3
Rukungiri	0.63196	15.80756	3
Bundibugyo	0.63618	15.81178	3
Bushenyi	0.73912	15.91472	3
Ntungamo	0.93625	16.11185	4
Kisoro	0.95449	16.13009	4
Kanungu	1.06952	16.24512	4
Kibaale	1.07696	16.25256	4
Kyenjojo	1.14630	16.32190	4
Kamwenge	1.24007	16.41567	5

## Appendix 6 Comparison of Equity Target Shares and the Planned PHC Allocations

Table 5.24 Comparison of equity target shares and the planned PHC allocations (2004/5) among the least deprived districts

District	Normalised Index	District Pop	Weighted Pop	% Share of weighted Population	Equity Target Share	PHC grant 2004/2005	Difference
Kampala	1.00000	1187795	1187795	0.33459	76090500	857495000	-781404500
Wakiso	8.98059	907736	8152007	2.29638	522219965	753712939	-231492974
Jinja	9.95843	387249	3856394	1.08632	247041743	369995000	-122953257
Kalangala	12.58548	34699	436703.4	0.12301	27975351	72158000	-44182648
Mukono	13.26014	795114	10543323	2.97000	675408396	709189000	-33780604
Masaka	13.96508	770379	10758402	3.03059	689186427	713908000	-24721573
Kasese	14.26957	522726	7459077	2.10118	477830673	209116000	268714673
Luwero	14.39637	478492	6888546	1.94047	441282322	432420000	8862322
Gulu	14.53222	475071	6903837	1.94478	442261867	466683018	-24421150
Nakasongola	14.63109	127048	1858850	0.52363	119078507	133030000	-13951493
Busia	14.75676	224887	3318604	0.93483	212590744	228520000	-15929256
Kabarole	14.86722	356704	5303197	1.49388	339724392	347298000	-7573607
Mbarara	14.95633	1088012	16272671	4.58394	1.042E+09	968829000	73603150
Mbale	14.96880	717534	10740621	3.02558	688047363	652960000	35087362
Mpigi	15.02125	407739	6124751	1.72531	392353335	371865000	20488334
Hoima	15.09910	343480	5186240	1.46094	332232088	316594000	15638088
Masindi	15.26213	459244	7009042	1.97441	449001298	49489000	399512298
Mubende	15.32102	689305	10560856	2.97494	676531579	613387000	63144579
Rakai	15.34856	470144	7216031	2.03272	462261116	419839000	42422116
Kiboga	15.35171	229297	3520101	0.99159	225498700	230303000	-4804300
Kayunga	15.42189	294568	4542795	1.27968	291012822	308791000	-17778178
Soroti	15.46204	369621	5715094	1.60991	366110630	288492000	77618630
Iganga	15.48264	708630	10971464	3.09061	702835263	661311000	41524263
Mayuge	15.52704	324668	5041132	1.42006	322936396	314817000	8119395
Tororo	15.54189	536732	8341832	2.34985	534380247	524360000	10020246
Kitgum	15.55658	282270	4391155	1.23696	281298668	279409000	1889667
Lira	15.62522	740893	11576616	3.26108	741601458	703061000	38540457
Kabale	15.68998	458107	7187690	2.02474	460445541	489019000	-28573459

Table 5.25 Comparison of equity target shares and the Planned PHC allocations to the most deprived districts (2004/5).

District	Deprivation Index	District Pop	Weighted Pop	% Share weighted Pop	Equity Target Share	PHC 2004/2005	Difference
Rukungiri	15.80756	275101	4348675	1.22500	278577397	277156000	1421397
Bundibugyo	15.81178	209820	3317628	0.93456	212528229	243425000	-30896770
Bugiri	15.89565	412365	6554809	1.84646	419903012	401144000	18759012
Bushenyi	15.91472	731217	11637112	3.27812	745476850	650311000	95165850
Ssembabule	15.93065	180028	2867964	0.80789	183722595	372732000	-189009405
Arua	16.00527	833538	13340998	3.75810	854628299	758079000	96549299
Adjumani	16.08387	202223	3252528	0.91622	208357933	198511000	9846932
Ntungamo	16.11185	379829	6119747	1.72390	392032791	372238000	19794791
Kisoro	16.13009	220202	3551877	1.00054	227534325	232738000	-5203674
Nakapiripirit	16.21126	154494	2504542	0.70551	160441680	184821000	-24379320
Kanungu	16.24512	204640	3324402	0.93646	212962150	209798000	3164150
Kamuli	16.24744	707242	11490869	3.23692	736108485	892268000	-156159515
Kibaale	16.25256	405761	6594654	1.85768	422455477	378702000	43753477
Moroto	16.28621	189907	3092866	0.87124	198129904	196996000	1133903
Kyenjojo	16.3219	377109	6155135	1.73387	394299799	354159000	40140798
Moyo	16.3255	194734	3179131	0.89554	203656055	205837000	-2180944
Sironko	16.33832	283056	4624659	1.30274	296257023	190056000	106201023
Kamwenge	16.41567	263595	4327089	1.21892	277194626	280931000	-3736374
Kapchorwa	16.42426	190282	3125241	0.88036	200203868	308791000	-108587132
Pallisa	16.45483	520532	8565268	2.41279	548693586	469541000	79152586
Kumi	16.48960	389599	6424330	1.80970	411544468	334551000	76993467
Kotido	16.54579	591870	9792957	2.75863	627339751	556899000	70440750
Yumbe	16.71069	251758	4207050	1.18510	269504896	226207000	43297896
Nebbi	16.74784	435252	7289531	2.05342	466969509	412374000	54595508
Katakwi	16.76880	298900	5012193	1.41191	321082597	491829000	-170746403
Pader	16.79681	326320	5481136	1.54401	351123199	295647000	55476199
Apac	16.85008	683987	11525234	3.24660	738309928	617708000	120601928
Kaberamaido	16.87036	131627	2220595	0.625532	142251983	141460000	791983.274

## Appendix 7 Comparison of Equity Target Shares and the Actual PHC

### Allocations

Table 5.26 Comparison of equity target shares and the actual PHC allocations to the least deprived districts (2004/5).

District	Dep Index	District Pop	Weighted Pop	% Share weighted Pop	Equity Target Share	PHC grant 2004/2005	Difference
Kampala	1.00000	1187795	1187795	0.33459	75783076	617335000	-541551923
Wakiso	8.98059	907736	8152007	2.29638	520110070	347089000	173021070
Jinja	9.95843	387249	3856394	1.08632	246043635	397031000	-150987364
Kalangala	12.58548	34699	436703.4	0.12301	27862324	198391000	-170528675
Mukono	13.26014	795114	10543323	2.97000	672679583	466401000	206278583
Masaka	13.96508	770379	10758402	3.03059	686401948	243278000	443123947
Kasese	14.26957	522726	7459077	2.10119	475900122	295468000	180432122
Luwero	14.39637	478492	6888546	1.94047	439499435	400902000	38597435
Gulu	14.53222	475071	6903837	1.94478	440475023	414834000	25641022
Nakasongola	14.63109	127048	1858850	0.52363	118597401	316403000	-197805599
Busia	14.75676	224887	3318604	0.93483	211731826	72115000	139616826
Kabarole	14.86722	356704	5303197	1.49388	338351824	372013000	-33661175
Mbarara	14.95633	1088012	16272671	4.58394	1038220473	189941000	848279473
Mbale	14.96880	717534	10740621	3.02558	685267486	308604000	376663485
Mpigi	15.02125	407739	6124751	1.72531	390768133	649918000	-259149867
Hoima	15.09910	343480	5186240	1.46094	330889791	132949000	197940790
Masindi	15.26213	459244	7009042	1.97441	447187224	276989000	170198224
Mubende	15.32102	689305	10560856	2.97494	673798228	228382000	445416228
Rakai	15.34856	470144	7216031	2.03272	460393470	660911000	-200517530
Kiboga	15.35171	229297	3520101	0.99159	224587631	757621000	-533033369
Kayunga	15.42189	294568	4542795	1.27968	289837060	488723000	-198885940
Soroti	15.46204	369621	5715094	1.60991	364631455	378473000	-13841545
Iganga	15.48264	708630	10971464	3.09061	699995639	856976000	-156980360
Mayuge	15.52704	324668	5041132	1.42006	321631655	279240000	42391654
Tororo	15.54189	536732	8341832	2.34985	532221222	230164000	302057221
Kitgum	15.55658	282270	4391155	1.23696	280162153	713477000	-433314846
Lira	15.62522	740893	11576616	3.26108	738605209	314627000	423978209
Kabale	15.68998	458107	7187690	2.02474	458585230	412125000	46460230

Table 5.27 Comparison of equity target shares and the actual PHC allocations to the most deprived districts (2004/5).

District	Deprivation Index	District Pop	Weighted Pop	% Share of weighted Population	Equity Target Share	PHC grant 2004/2005	Difference
Rukungiri	15.80756	275101	4348675	1.22500	277451877	372507000	-95055122
Bundibugyo	15.81178	209820	3317628	0.93456	211669564	708761000	-497091435
Bugiri	15.89565	412365	6554809	1.84646	418206503	141374000	276832502
Bushenyi	15.91472	731217	11637112	3.27812	742464944	184709000	557755944
Ssembabule	15.93065	180028	2867964	0.80789	182980312	369771000	-186790688
Arua	16.00527	833538	13340998	3.75810	851175395	702636000	148539395
Adjumani	16.08387	202223	3252528	0.91622	207516117	334349000	-126832883
Ntungamo	16.11185	379829	6119747	1.72390	390448884	288318000	102130884
Kisoro	16.13009	220202	3551877	1.00054	226615032	419586000	-192970968
Nakapiripirit	16.21126	154494	2504542	0.70551	159793457	205712000	-45918543
Kanungu	16.24512	204640	3324402	0.93646	212101732	815558000	-603456268
Kamuli	16.24744	707242	11490869	3.23692	733134429	280761000	452373429
Kibaale	16.25256	405761	6594654	1.85768	420748655	469258000	-48509344
Moroto	16.28621	189907	3092866	0.87124	197329411	652565000	-455235588
Kyenjojo	16.32190	377109	6155135	1.73387	392706732	226070000	166636732
Moyo	16.32550	194734	3179131	0.89554	202833236	968244000	-765410764
Sironko	16.33832	283056	4624659	1.30274	295060074	556562000	-261501926
Kamwenge	16.41567	263595	4327089	1.21892	276074693	524043000	-247968307
Kapchorwa	16.42426	190282	3125241	0.88036	199394996	209671000	-10276003
Pallisa	16.45483	520532	8565268	2.41279	546476732	275934000	270542732
Kumi	16.48960	389599	6424330	1.80970	409881729	491531000	-81649271
Kotido	16.54579	591870	9792957	2.75863	624805147	449217000	175588146
Yumbe	16.71069	251758	4207050	1.18510	268416032	613016000	-344599968
Nebbi	16.74784	435252	7289531	2.05342	465082840	196877000	268205839
Katakwi	16.76880	298900	5012193	1.41191	319785346	208990000	110795346
Pader	16.79681	326320	5481136	1.54401	349704577	376139000	-26434423
Apac	16.85008	683987	11525234	3.24660	735326978	353945000	381381977
Kaberamaido	16.87036	131627	2220595	0.62553	141677251	232597000	-90919749