Promoting equity in primary healthcare expenditure across districts in the North West province, in South Africa, using a needs-based resource allocation approach

Yasteel Maharaj [MHRYAS014]

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Faculty of Health Sciences School of Public Health and Family Medicine

Supervisor: Professor Diane McIntyre (Health Economics Unit, University of Cape Town)

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Date: 08 February 2016
Dedication

My gratitude to my Spiritual Master and Guru, Avdooth Baba Shivanandji, for His constant flow of unconditional love, grace and guidance.

Sab Dharti Kagaz Karu,
Lekhan Ban Raye.
Sath Samundra Ki Mas Karu
Guru Gun Likha Na Jaye.

“Even if the Earth is transformed into paper with all the big trees made into pens and if the water in the seven oceans are transformed into writing ink, even then the glories of the Guru cannot be written. So much is the greatness of the Guru.”

- Sant Kabir

To my parents, for their love and support throughout my university studies and the writing of this dissertation.
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List of Abbreviations

Bojanala- Bojanala Platinum District
DHS- District Health Services
HIV- Human Immunodeficiency Virus
KK/ Dr K Kaunda - Dr Kenneth Kaunda District
NMM/ NM Molema - Ngaka Modiri Molema District
PHC- Primary Healthcare
PMCT- Prevention of Mother to Child Transmission
RSM/ RS Mompati- Dr Ruth Segomotsi Mompati District
RAWP- Resource Allocation Working Party
SMR-Standardised Mortality Ratios
Abstract
The North West Department of Health requested that research be conducted on ways of addressing the inequity in district Primary Healthcare (PHC) spending. Literature has shown that using a needs-based approach to allocate resources may have a positive effect on equity across geographic areas. This study aimed to examine inequity in current district PHC expenditure, to examine the effect of using a needs-based methodology on equity in resource allocation (by examining different needs-based formulae) and finally to make recommendations on how to promote equity in PHC spending in the province.

Mid–to-senior level district and provincial management were interviewed to gain insights into their views on equity, needs-based resource allocation and the indicators of need to be included in the study. The suggested indicators of need were examined and appropriate data sources for each indicator were identified. Two sets of financial data were interrogated: 2013/2014 district PHC expenditure and the total provincial PHC budget from 2009/10 to 2013/14. Finally four needs-based resource allocation formulae were created and the possible effects on equity investigated.

Stakeholder interviews were recorded transcribed and analysed manually using the themes listed above. Firstly, the interviews were conducted to inform understanding on the current decision-making processes for the allocation of healthcare resources across districts and the current allocation of financial resources across districts in the North West province. Secondly, the interviews were used to select indicators which were later used to develop a resource allocation formula for the setting of equitable targets of expenditure across districts. The need indicators selected were population size and demographic composition (both taken from the Global Insights data base), the percentage of HIV prevalence in women attending antenatal services (adapted from the National Antenatal Sentinel HIV and Syphilis Prevalence Survey in South Africa) and a deprivation index (adapted from the 2007/2008 Health Systems Trust District Health Barometer).

The study found that Bojanala and Dr Kaunda districts were relatively under-resourced while NM Molema and RS Mompati districts were relatively over-resourced. It was found that the total PHC budget has recently been increasing by an average of 8% a year in real terms. A continued real increase in the overall PHC budget provides an ideal context for moving towards equity as it allows the budgets of relatively over-resourced districts to be held constant in real terms (rather than reducing them) and allocating all the additional resources to relatively
under-resourced districts. If this approach is followed, equity could be reached over an eight year period.
PART A: Protocol
1. Background

South Africa remains a country that is unequal in the distribution of healthcare, other social services and income, with a Gini index of 0.70 in 2008 (World Bank 2014). This makes South Africa one of the most unequal societies in the world as the closer the Gini index is to 1 the greater the inequity in income distribution.

Inequity in South Africa is a remnant of the former apartheid government, linked to the racial fragmentation of health services and the deregulation of the health system (Kautzky & Tollman 2008). It was only after the first democratic election, in 1994, that equity was brought into the policy agenda. The government aimed to decrease inequity in healthcare spending across provinces and to increase access to healthcare services in rural areas and other areas that were underserviced, due to apartheid policies (Bloom & McIntyre 1998). Yet health inequities can still be seen across provinces and districts, within provinces, in terms of disease profile, human resources for health and healthcare spending (Sanders and Chopra 2006). An Organisation for Economic Co-operation and Development (OECD) study by Kumar et al. (2014) shows that South Africa spends 42.2% of total healthcare expenditure on private health insurance. This is higher than the percentage share in any OECD country and is 6 times the OECD average. Private health insurance serves 16% of the total South African population, therefore the other 84% is dependent on the public healthcare system.

Currently provincial government provincial budgets are largely based on historical budgeting (also known as incremental budgeting). The issue with historical budgeting is that it preserves historical inequities, as the previous spending may not have occurred in an equitable manner. Provinces are assigned financial resources based on the provincial equitable share formula, as described by Hassim et al. (2007). This formula consists of 6 components, health being one of the components. Each of the components is given a specific weighting; health is given a weighting of 26%. The weights serve as a guideline to allocate resources across provinces. Provincial departments have autonomy in deciding how the funds from the global provincial budget are spent across sectors: hence, 26% of the global budget may not necessarily be spent on health despite this weighting in the equitable shares formula.

It may prove beneficial to reallocate financial resources from over-resourced provinces and districts to those that are under-resourced. This may have a positive impact on health equity. McIntyre and Gilson (2002) agree that reallocating resources across different levels of care,
focusing on primary care, and reallocating resources between provinces and districts are key mechanisms for achieving equity in the South African environment. Chopra et al. (2009) also suggest that emphasis should be placed on the provision of primary healthcare (PHC) services as well as the access to such services. This is due to a greater number of individuals accessing this level of care, as opposed to secondary or tertiary level care. In order for the PHC centred approach to be successful in decreasing health inequities, more spending on healthcare is required (Coovadia et al. 2009).

One possible method for reallocating public sector health resources is to use a needs-based resource allocation approach, which can move beyond the historical inequalities to create a more equitable distribution of resources across the population. Needs-based resource allocation focuses on social welfare by distributing resources based on need with an emphasis on promoting equity (Newbold et al. 1998).

2. Literature review

Needs-based resource allocation is the allocation of financial resources across units according to need. These units could be geographically defined (e.g. district) health authorities. Resources are therefore allocated in a manner that reflects the health needs of the population that these funds are supposed to benefit, to bring about equitable distribution of financial resources across districts. Needs-based resource allocation, therefore, takes into account indicators of need in order to calculate the level of relative need in geographic areas. This is indicated by the ‘target allocation’ for each area. Target allocations are the share of the total resources that each geographic area should be spending in order for resources to be distributed equitably.

When selecting indicators of need, those that are used most frequently, and that are of greatest importance, are population size, demographic composition, morbidity and mortality indicators, socio-economic status, and sometimes an indicator of the differing costs of providing services in different geographic locations (McIntyre and Anselmi 2012). The reasons for choosing these indicators as well as how these indicators reflect the need for healthcare are described below. Table 1 describes the indicators used in African studies.

Population size alone is generally not used as the only indicator of need in needs-based formulae, as population size does not reflect the differences in healthcare need present in the different population groups of each geographic area. However population size is a vital
indicator and a starting point for needs-based studies; a district with a higher population size will require a greater amount of healthcare services and, therefore, has a greater need for healthcare.

In order to get a better idea of the level of need, the population size is disaggregated for demographic composition, into sex and age groupings, with the 3 most important age groups being infants, the elderly and females of childbearing age. These age groups should access more healthcare in any given population. Infants have developing immune systems and thus fall ill often while the elderly have compromised immune systems and develop diseases associated with the onset of old-age. Women of child-bearing age access medical care more often than males in this age group, primarily for reproductive health services. These trends can be seen clearly when healthcare utilisation data is examined. The disaggregated population is then weighted by the respective average national utilisation rate, to ensure that the regional differences in demographic composition, reflect variations in the need for healthcare resources, are accounted for (McIntyre et al. 1990). Examples of morbidity and mortality indicators include maternal or infant mortality rates.

A powerful relationship exists between low socio-economic status and high rates of ill-health and mortality (McIntyre and Anselmi 2012). Low socio-economic status also limits the options in available healthcare and may influence treatment-seeking behaviour (Chuma et al. 2007). Taking socio-economic status into account when developing a needs-based formula for resource allocation, is vital as individuals who are poorer, depend more on the public health system for healthcare. The most common indicators of socio-economic status used in needs-based resource allocation approaches are composite asset and deprivation indices.
Table 1: Indicators used in needs-based resource allocation in African countries adapted from Pearson (2005), Semali and Minja (2005) and McIntyre and Anselmi (2012).

<table>
<thead>
<tr>
<th>Indicators of need</th>
<th>Mozambique</th>
<th>Namibia</th>
<th>Tanzania</th>
<th>Zimbabwe</th>
<th>Zambia</th>
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<tbody>
<tr>
<td><strong>Population related indicators</strong></td>
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<tr>
<td>Population size</td>
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<td>Demographic composition</td>
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<td><strong>Socio-economic status related indicators</strong></td>
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<td>Asset Index</td>
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<td>Deprivation index</td>
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<td>Available grain per capita</td>
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<td><strong>Burden of disease related indicators</strong></td>
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<td>Under 5 mortality rate</td>
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<tr>
<td>Infant mortality rate</td>
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<tr>
<td>Maternal mortality rate</td>
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<tr>
<td>Tuberculosis incidence</td>
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<tr>
<td><strong>Proxy for differences in the cost of providing services</strong></td>
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<tr>
<td>Population density</td>
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</table>
2.1 The history and success of needs-based resource allocation in developing countries

The implementation of needs-based resource allocation began in the United Kingdom during the 1970s. The RAWP formula calculated ‘equity target allocations’ based on population size, demographic composition (taking into account age and sex), weighted or adjusted by a local standardised mortality rate (as a proxy for illness) and adjusted for health service costs (Birch and Maynard 1986). Equal access for equal need was the original definition of equity used by RAWP; the principle of equity was brought to the forefront by this formula and it is this principle that is still at the heart of the NHS and its methodology for resource allocation (Buck and Dixon 2013). The objective of the RAWP formula was to set target budgetary allocations for 14 regional health authorities within England. These budgetary allocations for each district were phased in over a period of 15 years. At the end of the 15 year period, each of the regions were spending close to their respective equity target budgetary allocations (Smith 2008).

The success of the development and implementation of this formula in the United Kingdom, with the strong value it placed on equity, caught the attention of many countries, specifically developing countries where decentralisation was being pursued or already in place. For example, Bossert et al. (2003) undertook a study in order to investigate approaches to increase equity of healthcare funding in Cambodia and Chile; both of these countries have a decentralised health system like South Africa. A common approach used in both of these countries was the use of a population-based formula to allocate financial resources to provincial and municipal departments of health. This approach was successful in both countries in helping to achieve greater equity in the distribution of financial resources as well as per capita financial allocations at municipal level. The utilisation of the needs-based approach may, therefore, help to achieve equity at district level in South Africa.

3. Justification

McIntyre and Gilson (2002) state that, historically, the 3 most under-resourced provinces, in terms of funding for healthcare, were Limpopo (formerly the Northern Province), Eastern Cape and the North West. McIntyre (2012) argues that it is not only the distribution across provinces that is of concern but that more attention should be paid to the distribution of public sector resources across districts, within a province, as large differences in non-hospital PHC per capita expenditure exist across districts within a province.
The North West province is interested in having a study done on using a needs-based approach to distributing financial resources across districts, with a focus on PHC services. Currently, this approach for distributing public sector resources for health is not utilised in South Africa. Figures 1 and 2 (below) highlight the current inequities in spending in the province.

Figure 1: DHS expenditure per capita using the uninsured population. Adapted from the district health barometer 2011/2012 (Massyn et al. 2012) and 2012/2013 (Massyn et al. 2013)

Figure 1 shows the expenditure on district health services (DHS) per capita, using the uninsured population of each district in the North West province. The reason for using the uninsured population is that this is the sector of the population that is most dependent on public healthcare. Therefore using the uninsured population for the per capita calculation gives a more accurate indication of expenditure as those with private health insurance cover may opt to use private medical facilities. The expenditure data does not, however, take into consideration the spending on coroner services. Provincially, the North West fell below the national average of R1,327 per capita spending; only R1,247 per capita (uninsured) was spent on district health services in 2013. In 2011 the national average expenditure on DHS was R1,191 and in 2013 the national average DHS expenditure was R1,327. Despite the increase in average expenditure on DHS, inequities in district level expenditure remain, with the Bojanala and Dr K Kaunda districts falling below the national average in both 2011 and 2013.
It can be seen in Figure 2 that the national average PHC per capita spending has increased from R684 in 2011 to R780 in 2013. However, inequity in PHC expenditure across districts in the North West is preserved. A trend highlighted in Figure 2 is that the Bojanala and Dr K Kaunda districts fall below the national averages in both 2011 and 2013. The PHC services accounted for in the above data are non-hospital PHC services, these being clinics, community healthcare centres, other community-based services, nutrition and HIV.

Thomas et al. (2004) state that examining per capita PHC expenditure allows for inequity in expenditure across provinces and districts to be highlighted. While this analysis does not give an indication of the need for healthcare it is a stepping stone in bringing inequity to the forefront.
4. Aims and objectives

The aim of this study is to assess the current distribution of spending on PHC services and explore ways of promoting equitable spending on PHC level care across districts in the North West province by using a needs-based resource allocation approach. The objectives are as follows:

1. Investigate the current decision-making process for the allocation of healthcare resources across districts and the current allocation of financial resources across districts in the North West province.

2. Critically evaluate a needs-based approach to healthcare resource allocation in the North West province, including assessing alternative potential resource allocation formulae.

3. To make recommendations on how to promote equity in the distribution of financial resources for healthcare across districts in the North West province.

5. Study Site Description

The North West province lies in the north-west of the country, bordered by 4 provinces namely: Limpopo, Gauteng, the Free State and the Northern Cape. The North West province has a total population of 3,509,953 (Statistics South Africa 2012). This province has 4 districts and 19 sub-districts. The land area in square kilometres is 104,882. In 2011, this province’s size was decreased the most since 2001 by 113 48,9 square kilometres (Statistics South Africa 2012). Each of the districts has a different population size and, therefore, differences in population density may occur (measurement of population number per unit area). According to the Municipal Census report, the greatest population exists in the Bojanala district (1,507,501) and the smallest population exists in the RS Mompati district (551,165) (Statistics South Africa 2012). Figure 3 below details the 4 districts of the North West province.
6.Methodology

Description of the research process

The majority of this research project is dependent on the collection and analysis of secondary data. However secondary data analysis will also be supplemented by primary data collection. This will take the form of key informant interviews to understand current resource allocation decision-making processes and to give stakeholders the opportunity to voice their opinions on the needs-based approach, as well as on indicators that could be included in the needs-based formula. The indicators of need eventually used will depend entirely on the secondary data that is available for analysis at district level. Sources of secondary data and methods of collection and analysis of primary and secondary data are described in detail below for each of the objectives.

6.1 Objective1

Financial resources for health (funding flows and budgetary information)

District Health Services is programme 2 of the Health Budget for the province. The above data (in Figure 1) takes into account the expenditure on all of these sub-programmes except expenditure on Coroner Services (sub-programmes 2.8).

PHC falls within programme 2 and takes into account expenditure on sub-programmes 2.2 to 2.7 within the DHS programme. These sub-programmes are namely community health clinics, community health centres, community-based services, other community services, HIV and nutrition. This is referred to in Figure 2.
In the Vulindlela database, the PHC services taken into account are community health clinics, community health centres, community-based services, HIV/AIDS, nutrition and district management. The annual total recurrent PHC healthcare budget and expenditure will be examined from 2009/10 to 2013/14 to find out if there has been any real increase in the healthcare budget during this 5 year period. This data will be drawn from Vulindlela.

**Healthcare expenditure across districts for PHC**

The total expenditure on PHC for each district in 2013 will be examined as this will be used as the current amount that each district is receiving, as part of the calculations in the needs-based formulae construction. Expenditure data is a better indicator of resource use than budget allocation figures.

**Current resource allocation decision-making processes**

Stakeholders will be interviewed about current decision-making and resource allocation processes (see Appendix B). This will be the only source of information used to provide insights into the decision-making process.

**6.2 Objective 2**

The initial part of achieving this objective is deciding on which indicators of need to incorporate into the needs-based formula. The selection of the indicators of need will be dependent on two factors: firstly, the indicators that the stakeholders feel are most important to be included in the formula and secondly the data available on the respective indicators of need. This investigation, therefore, occurs in 2 parts. First, allowing stakeholders to express their views on needs-based resource allocation and the indicators of need they deem most important and secondly, critically assessing these indicators relative to what are considered appropriate indicators of need in the international literature and examining the availability of secondary data on the possible indicators of need.

**Examining secondary data on indicators of need**

**Population related indicators of need**

Disaggregated 2011/2012 district population data by age and sex can be obtained from 2011 Municipal census data (Statistics South Africa 2012). However, stakeholders will be asked if there is a more accurate and timely population data set available for use in the study. The average national outpatient utilisation rates for each age and sex group are needed for the calculations.
These utilisation rates, in the form of the average number of outpatient visits per person per year, will be obtained from the South Africa Consortium for Benefit Incident Analysis (SACBIA) household survey (McIntyre 2010). This survey was conducted in 2008 and used a one month recall period for outpatient utilisation reporting. Reported utilisation was adjusted using a seasonality index (Ataguba and McIntyre 2012). While some may argue that utilisation rates may have changed from 2008 to 2013, it is the most recently available utilisation rate data available in South Africa (other surveys do not allow for the calculation of utilisation rates). The national average utilisation rates will be normalised in this study by dividing the lowest utilisation rate (from the age group 6-20 years) by the national utilisation rates for each of the other age and sex groups. The normalised rate will be used and not the actual average national utilisation rate for each age and sex group.

Socio-economic status related indicators of need

A range of options exists in terms of socio-economic indicators of need for healthcare, such as deprivation indices and asset indices, as mentioned above. The deprivation index and asset indices are composite measures of material and social deprivation and asset ownership, respectively. The calculation of deprivation and asset indices require principal components analysis (PCA) to be conducted, in which different socio-economic variables are summarised into one index that indicates the level of deprivation or assets, respectively, present in the population that resides within that district. Calculated deprivation indices (as well as the PCA methodology and the indicators used) for each of the 52 districts of South Africa are available from the Health Systems Trust (Day et al. 2009), using data from 2007. Data for these indicators were gathered from the 2007 Community Survey and the General Household Survey from 2006 and 2007. This is the most recently conducted analysis on deprivation indices at a health district level published in South Africa.

A less complicated indicator of socio-economic status exists due to the work of McIntyre et al. (2002). This study investigated the development of a composite deprivation index, to inform resource allocation across small geographic locations. One of the important outcomes of this study is the identification of a single indicator of deprivation that could be used instead of developing a composite deprivation index using PCA methods. It was found that access to piped water in households was the variable most highly correlated to the composite deprivation index ($R^2=0.877$). The relationship of this socio-economic variable to illness (and hence potential need for care) variable is easy to understand, from a medical and biological standpoint. Individuals who do not have access to clean piped water will carry disease-causing microorganisms (such as viruses and bacteria) on their hands. These individuals will not have the opportunity to wash
their hands, which will aid in the spread of bacteria to others in the same household and the community. Similarly, difficulties in accessing uncontaminated water for drinking will increase the burden of disease in the population residing in the district. WaterSHED (2010) found that unsafe drinking water and poor hygiene and sanitation are factors that contribute to the burden of diarrheal disease globally. These factors and disease affect those with a poor economic status (those living in rural areas) as well as the young and the elderly.

Data on access to piped water is available in annual household surveys and is easy to verify, thus, the data is more accurate and recent. Also, as a single indicator of deprivation, it is less complicated to work with. The high correlation adds to the scientific backing in choosing this indicator to reflect a wide range of deprivation factors. However, the deprivation index developed by the Health Systems Trust takes into account access to piped water as well as a range of other socio-economic indicators. Therefore, this indicator will be used as the indicator of socio-economic status at district level.

**Burden of disease related indicators of need**

Standardised Mortality Ratios are a good measure of mortality but they are not a good reflection of morbidity, as individuals may recover from an illness and not necessarily die due to these illnesses. In addition, this type of mortality indicator is not available in South Africa due to poor death reporting. Individuals in rural areas may fail to report deaths resulting in under-reporting of mortality data. If mortality is to be used as an indicator of healthcare need in a context of poor vital statistics, then infant or maternal mortality rates (which can be estimated from household survey data) can be used. However, mortality rates do not necessarily reflect morbidity. An alternative therefore, is to look at the disease profile of the population, which could reflect morbidity more accurately, albeit only for specific diseases. As seen in Appendix B stakeholders will be asked to suggest a valid and accurate morbidity indicator that takes into account morbidity at district level.

**Primary data collection**

This component of the study is qualitative in nature. The purpose of conducting stakeholder interviews is to get the views of those stakeholders responsible for making decisions on resource allocation (stakeholders at provincial level) and those stakeholders whom these decisions will affect (stakeholders at district level, such as district managers). The inclusion criterion for stakeholder selection is that the stakeholders who are interviewed must therefore, fall into the above 2 categories. The stakeholders (mid to senior level management) will be approached for an interview at both levels.
provincial and at district level. The main personnel of focus will be individuals who are directly or indirectly responsible for preparing budgets or making resource allocation requests for districts. See Appendix B for the interview schedule and detailed interview questions.

The study coordinator will email stakeholders requesting them to participate in the interviews while simultaneously asking those stakeholders to ask members of their office (whom they feel will be able to give insights) to also participate. It will be left to the discretion of the stakeholders as to whether they want to be interviewed individually or in groups of 2 or 3. The aim of the study, as well as the importance of the study, will be described to them in the email. This snowballing technique will therefore increase the number of stakeholders participating in the study. Due to the qualitative nature and the snowballing technique used in stakeholder selection, it is difficult to calculate a sample size for stakeholders to be interviewed, however, it is estimated that between 20 and 25 stakeholders will be interviewed. After agreeing to participate in the interviews, an informed consent form will be signed by the stakeholders being interviewed.

During the interview, all stakeholders will be asked about how resources are allocated to the provincial Department of Health and districts currently, and their views and opinions about equity and the allocation of resources based on need. All stakeholders will be asked about which indicators of need they believe to be important in the study as well as which burden of disease indicators may be most appropriate. This is specifically important for district managers as they will have knowledge on which burden of disease indicators exist at district level. Thereafter, district managers will be asked which burden of disease indicators they believe reflect healthcare need best in their respective district, relative to other districts. For example, the District Health Barometer 2013 (Massyn et al. 2013) examined the leading causes of death in 2009 and 2008 for each of the 52 districts in South Africa. In the North West, the leading causes of death (in terms of years of life lost, YLL) were lower respiratory tract infections (Bojanala and NM Molema districts) and tuberculosis (RS Mompati and DR K Kaunda districts). South Africa is one of the countries with the highest incidence of TB, as well as drug-resistant TB, in the world. These may be appropriate indicators of burden of disease, but need to be confirmed through key informant interviews.
Calculations of equity targets (McIntyre & Anselmi 2012)

Calculating the weighted population for each district

Step 1: Obtain total population size for each district then disaggregate population data for districts by age and sex and obtain national average outpatient utilisation rate for outpatient PHC services, disaggregated by age and sex.

Step 2: Normalise the national average outpatient utilisation rate by dividing all the utilisation rates for each age and sex group by the lowest utilisation rate.

Step 3: Calculate the weighted population by multiplying the population for each age and sex group by the respective normalised utilisation rate.

Weighting the population for burden of disease (TB incidence is used here to illustrate the process)

Step 1: Obtain TB incidence rates for each district

Step 2: Normalise the TB incidence rate for each of the districts by dividing the TB incidence rates for each of the districts by the lowest TB incidence rate.

Step 3: Multiply the weighted age-sex population for each of the districts by the respective normalised TB incidence rate for that district.

Weighting the population for deprivation indices (or another form of socio-economic status)

Step 1: Calculate the deprivation index for each district

Step 2: Normalise the deprivation index for each of the districts by dividing all the deprivation indices for each of the districts by the lowest deprivation index.

Step 3: Multiply the weighted age-sex population for each of the districts by the respective normalised deprivation index for that district.

It should be noted that the indicators used for weighting (in the deprivation index) could themselves be attributed different weights.

Calculating the equity target allocation for each district

The equity target allocation for each district is calculated by dividing each district’s population, weighted for age-sex, the burden of disease and socio-economic status by the total weighted provincial population. The percentage obtained from this calculation is the percentage share of the total budget for PHC services each district should receive; this is known as the equity target allocation. A similar approach can be used to calculate target equity allocations using different combinations of the indicators of need (e.g. only using population size, or using age-sex
weighted population, etc.) This will result in different equity target allocations for a specific district depending on the indicators used. Target allocations based on all combinations of indicators will be represented graphically in the report and the implications of alternative resource allocation formulae will be presented. The distribution of actual expenditure data for each district can then be compared to the equity target allocation to see the extent to which the actual expenditure differs from the equity target allocation.

Once the formula has been decided upon and the target allocations are calculated, it is vital to consider the pace of change. The pace of change is the rate at which there will be a relative re-allocation of resources from districts that are above target to those that are below target, over time. This is important as districts will not be able to cope with large decreases or increases in their allocated budgets. Districts which are allocated largely increased budgets may not be able to absorb the increase in funds, by using it more effectively and equitably. In the case of England, resource re-allocation took a period of 10-15 years to be able to bring under-target and over-target districts closer to their target allocations. This pace of change was determined through setting a ceiling of 5% (in budget growth) and a floor of 2.5% (in budget reduction) (Department of Health and Social Security, 1976). McIntyre & Anselmi (2012) note that it is far easier to achieve relative redistribution in district budgets when the overall budget for district level services in the province is increasing. In this way, the budgets of districts that are relatively over-resourced can remain constant in real terms while additional resources provided by the increased provincial budget can be re-allocated to districts that are below target and thus help to move these districts closer to their respective target allocations. The pace of change and magnitude of annual budget changes are therefore an important part of the needs-based resource allocation approach.

6.3 Objective 3

Recommendations to promote equity in the province, across districts will be made in 2 ways. The first is this study being presented in the form of a report that major stakeholders will have access to. The second is the policy brief that will be created after the study has been completed. This policy brief will be a summary of the study, and will particularly present the effect of various re-distribution options in order to promote equity in terms of resource allocation based on need. This policy brief will be emailed to stakeholders in order to make them aware of the outcomes of the study. Efforts will also be made to make a verbal presentation to the North West Department of Health.
7. Analysis

7.1 Data management and security

Qualitative and quantitative data will be managed via Microsoft Excel (2012) and Microsoft Word (2012) respectively. Some of the quantitative data such as the data gathered from census or household surveys are available in the public domain. However, while aggregated expenditure data are publicly reported on, disaggregated data on healthcare expenditure are available at provincial and district level (not in the public domain). All data will be stored on a password-protected laptop and will only be accessed by the researcher. It is also important for qualitative data storage that no identifiers are present on the transcribed copies of the interviews, such as names of stakeholders. After research is complete and transcripts have been analysed transcripts, voice recordings and informed consent forms will be destroyed.

8. Data Analysis

8.1 Qualitative data

The interviews will be recorded on Voice Recorder software on a Samsung S5 mini and then transcribed into Microsoft Word (2012). The interview transcripts will be analysed manually by looking for the following themes: the views expressed on equity and needs-based resource allocation, the views on indicators of need and the indicators of need preferred by stakeholders.

8.2 Quantitative data

The data analysis will be conducted in Microsoft Excel (2012). Firstly, a spreadsheet containing data on district PHC expenditure for 2013/14 financial year will be created. This data will be used as the amount and the percentage of resources that each district is currently receiving. Secondly, a spreadsheet will be created containing the data for population size, demographic composition, indicators of disease burden and socioeconomic status for each district. This worksheet will also contain the normalised data for each data set as this will be used in weighting each district’s population in the calculations.

The calculations for population weightings will be calculated (as described above) in Microsoft Excel (2012). Target allocations based on all combinations of indicators will be represented graphically which will demonstrate the difference in actual expenditure in the regions and the respective equity target allocation to demonstrate which districts are above or below the respective equity target allocations.

Target allocations based on all combinations of indicators will be represented graphically in the
report and the implications of alternative resource allocation formulae will be presented. The
distribution of actual expenditure data for each district can then be compared to the equity
target allocation to see the extent to which the actual expenditure differs from the equity target
allocation. Changes in resource allocation based upon alternative paces of change will be
demonstrated in a graphical form to show the effects of different time options on redistribution
as well as the average annual change in each district’s budget, resulting from the different time
frame options. This will allow for those in charge of budgeting and resource allocation to make
a more informed choice when deciding if and how to take forward the findings of the study in
future inter-district resource allocation and budgeting planning.

9. Ethics and communication

9.1 Ethics

Before the interviews, informed consent will be obtained from stakeholders and stakeholders
will be made aware that the information collected during the interview will be kept confidential
and that they may choose not to participate in the interview at any point. Interviews will take
place in English. See Appendix B for the informed consent form. The protocol will be submitted
to the UCT Human and Ethics Research Committee and to the Department of Health of the North
West province for approval to undertake research.

9.2 Reporting and dissemination of results

Stakeholders will be made aware of the results of the study via the policy brief that is a
component of the dissertation. The study will also be formally presented to the North West
Department of Health. An attempt will be made to publish the study in a peer-reviewed journal,
thereby contributing to the knowledge on needs-based resource allocation in developing
countries.

10. Risks and benefits

10.1 Risks

Minimal risk is expected in the study. Stakeholders will be made aware that the information
given and recorded during interviews will be kept confidential, thereby minimising the risk of
being identified as stating something specific or feeling uncomfortable when expressing their
view or concerns.
10.2 Benefits

There are no direct benefits to stakeholders (as participants); however there is an indirect benefit to society, particularly individuals that depend on the public health system for primary healthcare, by having resources equitably allocated enabling service provision in line with healthcare need. Other societal benefits include an increase in knowledge relating to needs-based resource allocation in a low-to-middle income country context as well as providing an incentive to improve data collection and monitoring mechanisms to improve the use of a needs-based resource allocation approach. The improved data collection system may be beneficial to other research and health management that may occur at local level.
### 11. Logistics

**Table 2: Timetable for proposed implementation**

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12. References


Appendix A: Information sheet and informed consent form

Introduction

I am currently a student at The University of Cape Town, pursuing my Masters in Public Health (MPH-Health Economics). My dissertation is entitled ‘Promoting equity in the North West province, in South Africa, by utilizing a need-based resource allocation approach’. Part of this study requires that I interview management of the Department of Health in the North West, including provincial and district managers. The topics to be covered in the face-to-face interview include: current methods of resource allocation and budget decision making processes, your views and understanding of equity, your views on allocating resources based on need for healthcare and indicators of healthcare need you feel should be used in the study. I would greatly appreciate it if you choose to participate in the face-to-face interviews, and answer the questions on the above topics.

Purpose of the study

To assess the current distribution of spending on PHC services, and explore ways of promoting equitable spending on PHC level care across districts in the North West by using a needs-based resource allocation approach.

Procedures

If you agree to participate in the face-to-face interviews you will be required to answer questions related to the above topics. The interview will be recorded and then transcribed with your permission. The interview will take between 30 to 45 min.

Risks and discomforts

There is no risk involved in taking part in the interview. You may withdraw from the interview at any time. You may also choose to answer only the questions you feel comfortable answering.

Potential benefits to society/ subjects

There are no direct benefits to you as a participant. However there is an indirect benefit to the population of the North West as this study may aid in promoting equitable healthcare spending through allocating public sector resources for healthcare based on need. If a needs-based resource allocation approach is adopted in the North West, this may be an incentive to improve data collection on the indicators of need used in the study. In this way the needs-based formula
can be updated over time. This study will also increase the knowledge on needs-based resource allocation approaches in developing countries.

Confidentiality

The primary data collected during the face-to-face interviews will be kept confidential by the use of a numbering system and pseudonyms. No identification numbers or names and surnames will be present on transcripts of face-to-face interviews. Only the researcher will have access to these recordings and transcripts. Information from these interviews will be presented in aggregate form wherever possible, and quotations will not be attributed to individual interviewees.

Participation and withdrawal

You may choose not to participate in the study and can choose to withdraw from the study at anytime. You may also choose not to answer questions you feel uncomfortable with but continue with the interview and answer the rest of the questions. Please note that your decision on whether or not to participate or to withdraw from the interview will have no impact on your current or future employment at the North West Department of Health. If you have any queries or concerns regarding your rights or welfare, please feel free to contact the University of Cape Town, Faculty of Health Sciences’ Human Research Ethics Committee (HREC). The contact details for the committee are provided below.

Contact details for the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee (HREC)

Address: E 52, Room 24, Old Main Building, Groote Schuur Hospital, Observatory
Telephone number: 021 406 6492
Fax number: 021 406 6411

Contact details for study supervisor

Name: Prof. Di McIntyre

Cell number: 082-4962345

Email: diane.mcintyre@uct.ac.za
Contact details for researcher

Name: Yasteel Maharaj

Cell number: 0832625137

Email: yasteel.maharaj@gmail.com

Signature of participant

I _____________________________(participant’s name) am willing to partake in the face-to-face interview, conducted in English. I understand that the information given by me during the interview will be recorded and then transcribed. I am aware that the information given by me during the interview will be kept confidential. I have been given a copy of this document.

__________________________  __________________________
Participant’s signature       Date of interview

Signature of Researcher

__________________________  __________________________
Researcher’s signature       Date of the Interview
Appendix B: Interview schedules

Interviews with district managers

Please describe how budgets are allocated to your districts?

How is your budget decided on? What criteria are used in deciding on how much to give a district? Do you receive any guidance from province on the size of the budget you may apply for?

Do you know how the guideline amount is determined?

Does province take account of budget requests from the districts? Do you think that resources are allocated equitably across districts? How would you define the concept of equity?

Do you know if equity guides decision making in your province? If yes, how is equity taken into account?

Do you believe that resources should be allocated across districts in your province taking account of the relative need for healthcare in each district? Why or why not?

What do you understand of the concept of need for healthcare?

What indicators do you believe reflect the need for health services within your district?

Prompts (note which indicators are or are not supported for inclusion in a needs-based resource allocation approach):

- Population size
- Demographic composition
- Socio-economic status
- Burden of disease
- Differing costs for providing care in different geographic locations

Which morbidity and mortality indicators exist at district level? Which of these indicators do you believe reflect the burden of disease best in your district relative to the other districts in the North West?

If you received extra financial resources for health, above your normal budget, right now, would you be able to use these resources in an effective way in your district? If yes, how?
Interviews with provincial managers

Please describe how the budget for health is allocated to your province? What criteria are used in determining the size of the health budget?

How is the overall health budget then subdivided into sub-programmes (such as District Health Services) and how is the DHS budget divided across the 4 districts?

Do districts receive any guidance from province on the size of the budget they may apply for? If yes, how is the guideline amount is determined?

Does the provincial Department of Health receive budget requests from the districts? Are these requests considered and taken into account in deciding on the allocation to districts?

Do you think that resources are allocated equitably across districts? Why or why not? How would you define the concept of equity?

Do you know if equity guides decision-making in your province? If yes, how?

Do you believe that resources should be allocated taking account of the relative need for healthcare in each district? Why or why not?

What do you understand of the concept of need for healthcare?

Which indicators do you believe reflect the need for health services across districts in your province?

Prompts (note which indicators are or are not supported for inclusion in a needs-based resource allocation approach):

- Population size
- Demographic composition
- Socio-economic status
- Burden of disease
- Differing costs for providing care in different geographic locations

Which morbidity and mortality indicators exist at district level? Which of these indicators do you believe reflect the burden of disease best in different districts in the North West?
PART B: Literature review
1. Background

The equitable allocation of financial resources for healthcare is a policy objective that is common in many countries, as allocating resources in an equitable manner aims at addressing the health inequities in the countries by allocating resources to where they are needed most. In certain healthcare systems, the trend has been to allocate resources using an incremental or historical approach (Ensor et al. 2012). Historical budgeting entails geographic areas receiving their health budgets similar to the previous year, with an inflation adjustment. On consulting the papers produced by the search, countries that have used a historical resource allocation approach include the UK (before 1970), Indonesia, Pakistan, and Zambia (Mooney 1982, Ensor et al. 2012, Green et al. 2000 and Zere et al. 2007).

Resource allocation itself can be defined as “the process by which available resources are distributed among competing needs” (Zere et al. 2007). Needs-based resource allocation is sometimes also referred to as risk-adjusted resource allocation (McIntyre 2007) as healthcare need is frequently equated with health risk (the likelihood of falling ill and needing healthcare). However, risk of illness and need for health care are not always the same. For example, a person may not be ill but may need health care, particularly preventive and promotive care such as antenatal care. Needs-based resource allocation distributes resources in such a manner that it takes into account the proportion of future healthcare costs of the respective geographic areas. As the proportion of healthcare needs increase in a geographic area, the proportion of future healthcare costs increase. Therefore, certain studies state that the use of a needs-based approach to resource allocation increases the chance of a country moving towards or strengthening equity (Smith 2008 and Green et al. 2000). This is due to this approach moving the geographic areas towards their target expenditure shares and resources being allocated according to the relative proportion of need present in each geographic area.

The issue with historical or incremental budgeting methodology is that it preserves past resource allocation inequity. This is due to the fact that the healthcare needs of the population are not taken into account during the allocation of resources. It is, for this reason, that needs-based resource allocation methodology has been developed and has been advocated for (and in certain cases implemented) in both developed and developing countries, as this literature review will demonstrate.

The aims of this literature review will be to firstly examine the definitions and concepts of equity and need in the context of resource allocation, within the papers produced by the search phrase. Secondly, it will discuss the experience of countries that have implemented a needs-
based approach to resource allocation, and examine the indicators of need in the literature. Thirdly to examine the effect of the formula on equity (in the event that the need-based resource allocation formula was utilized) and lastly, to draw conclusions about the appropriateness of using different need indicators.

2. Methods

This is not a formal systematic literature review, but it is rather a structured literature review on concepts around needs-based resource allocation (specifically equity and need, in the sphere of needs-based resource allocation) as well as the experiences of countries that have utilised a needs-based approach to resource allocation.

The primary objective of this literature review is to find articles on countries that have used a needs-based approach for allocating government or public sector financial resources for healthcare. The secondary objective is to analyse the understanding of the concepts of equity and need (within the context of needs-based resource allocation for health) within these articles. Thus specific keywords were chosen in order to limit the number of papers that the search engines produced. Science Direct, PubMed Central and EbscoHost (selecting CINHAL, MEDLINE and EconLit) were searched for articles. This search was performed using the student access platform provided by the UCT Library, from November 2014 to January 2015. No year limits were placed on the search. This was done to increase the number of papers produced by the search. Papers produced by the search that were not available as full-text articles were searched for using alternative methods such as Google.

The first step involved creating keywords for the search strategy. Thereafter a search phrase was created. Synonyms for needs-based resource allocation such as population-based resource allocation were tested in the selected databases. It was found that this search phrase produced articles that were not specific to needs–based resource allocation and the number of articles produced was very high. Thus, the search phrase ‘needs-based resource allocation OR needs based resource allocation AND equity AND healthcare’ was used to produce the articles used in this study. Figure 1 depicts a Venn diagram showing the combined keywords in the search phrase. Adding the keywords ‘equity’ and ‘healthcare’ to the search phrase, increased the specificity of the articles produced by the search and decreased the number of articles produced.
The second step involved scanning titles and abstracts of the articles produced by the search. To aid with this process, a set of inclusion (Table 1) and exclusion criteria (Table 2) were developed. Figure 2 shows the amount of papers produced by each database before and after the application of the inclusion and exclusion criteria and duplicate removal. In order to increase the comprehensiveness of the section on needs-based resource allocation, websites such as Equinet were used to find papers on needs-based resource allocation (in developing countries). References from papers (produced by the search) dealing with needs-based resource allocation were followed up to get more detailed information on country experiences and, where necessary Google was used as a search engine to find published work about specific county resource allocation formulae. A total of 38 papers were selected based on the inclusion and exclusion criteria. The inclusion criteria can be summarised as papers or studies on needs-based resource allocation for healthcare, using specific indicators of need (such as population size, demographic composition and disease burden etc.) between geographic locations. These papers include country studies as well as papers on needs-based resource allocation concepts. Table 1 can be referred to for detailed inclusion criteria. Exclusion criteria can be summarised as papers on other forms of resource allocation, allocation of resources that are not financial (for example human resources), papers on needs-based resource allocation for sectors other than health, resource allocation in the private health sector etc. Table 2 can be referred to for a detailed list of exclusion criteria.

In order to address the aims of the literature review, after all 38 papers were consolidated; the following themes were selected to find specific and relevant information within the papers. These themes included:

- Measuring healthcare need and definitions of healthcare need within the context of needs-based resource allocation.
- The definitions and concepts around equity of financial resources for healthcare provision in the context of needs-based resource allocation.
- The need for allocating resources equitably including the concept of historical budgeting.
- General definitions of resource allocation.
- Definitions and concepts of needs-based resource allocation (the history of needs-based resource allocation).
- Countries that have used needs-based resource allocation and their experience in formula construction (weightings and indicators of need used).
- Country experiences in implementation (issues surrounding pace of change and the effect of formula usage on equity, in the distribution of resources).
• The gaps in research on needs-based resource allocation.

Figure 1: Venn diagram depicting keywords searched and the key phrase entered into the search bar.

Table 1: Inclusion criteria

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<th>Studies dealing with resource allocation for healthcare</th>
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<td>Allocation of public sector financial resources for healthcare</td>
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<td>Allocation of financial resources for health across geographic areas</td>
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<td>Allocation based on indicators of need (population size, disease profile etc.)</td>
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<td>Studies on countries that have used a needs-based resource allocation approach</td>
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<td>Definitions or concepts on healthcare need for resource allocation</td>
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<td>Definitions or concepts on equity for healthcare resource allocation</td>
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<td>Studies on specific indicators of need</td>
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<td>Studies showing the effect of needs-based resource allocation on equity in countries</td>
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Table 2: Exclusion criteria

<table>
<thead>
<tr>
<th>Studies dealing with resource allocation for ecology, food policy, energy, the environment and education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studies dealing with other types of resource such as human resources</td>
</tr>
<tr>
<td>Allocation of financial resource across different levels of care or facilities or re-allocation for specific diseases</td>
</tr>
<tr>
<td>Allocation based on disease outcomes or demand for healthcare resources (such as patient input or bed utilisation rates)</td>
</tr>
<tr>
<td>Allocation for healthcare technology</td>
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<tr>
<td>Allocation for private healthcare</td>
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Figure 2: Flow chart displaying the number of papers from each database and the total number of papers after applying inclusion and exclusion criteria for screening titles and abstracts and the final number of papers after removing duplicates.

3. Introduction

3.1 Introduction to needs-based resource allocation – history and definition

The movement towards using a needs-based approach to resource allocation began in the 1976 (Smith 2008) in the UK. This was started by RAWP the (Resource Allocation Working Party). The papers produced by the literature search showed that RAWP had one key objective in utilising this approach. This was that they wished to achieve geographic equity across the districts present in the UK (Mays 1987) and to allocate resources based on the needs (Mooney 1982) of the population the health system aimed to serve. The goal of RAWP was to achieve equal access for equal need and this lay at the heart of the RAWP initiative. This influenced other areas such as Scotland, Wales and Ireland to follow suit (Mays 1987). Equal access for equal need meant that those who had similar healthcare problems would have the opportunity to access the same type of care. The work of RAWP has influenced many countries (both developed and developing) to create their own needs-based formulae or research into this methodology. The UK experience will be examined later in the literature review.

Due to equity being an important policy objective, the demand for needs-based resource allocation has increased even in settings where data sources are poor (Smith 2008). The
demand for a needs-based approach is due to the fact that it promotes equity by shifting resources to where they are actually needed (Ensor et al. 2012) thus playing a role in decreasing previous inequities in resource distribution due to historical budgeting. Birch and Chambers (1993) also advocate for this approach by stating that a needs-based methodology will shift resources to where the need is highest and this would mean that these populations would have the highest chance of improving their health status, due to the extra resources received. Consequently, there will be an increase in the efficiency of the healthcare system.

Historical or incremental budgeting is awarding geographic areas the same amount of financial resources as the previous year, adjusting for inflation. This form of budgeting does not take into account the current healthcare need of each area, hence the preservation of existing inequities in resource allocation. Therefore, due to resources not being allocated on the basis of the healthcare need present in the population there is a constant mismatch between current healthcare need and the available resources (Green et al. 2000). The needs-based approach aims to break this inertia of inequity by allocating resources taking into account the proportion of need in each geographic area.

The papers produced were searched for a reliable working definition of needs-based resource allocation. The definition preferred for this study is: “allocating resources based on relative need using a mathematical formula” (Manthalu et al. 2010). This definition was selected as it remains true to the process of creating a needs-based formula, as indicators or proxies of healthcare need are used to create a formula that produces target shares for each geographic location. This target allocation shows what financial resources a geographic location should be getting in order to reach equity. In this approach, the target allocation or share serves as a guide to achieve equity across the different geographic locations.

This would imply that resources are allocated based on need more fairly, by examining each geographic location’s proportion of healthcare need, relative to the other geographic areas. The objective of needs-based resource allocation is to allocate resources in such a way that it is to the advantage of the most disadvantaged populations or geographic areas (this is known as Maximin Theory) (Culyer 2001). This would be due to the fact that poorer or more disadvantaged areas would have higher healthcare needs compared to the more wealthy areas, thus, the resource allocation formulae would bring these issues to the forefront. A combination of these definitions would define needs-based resource allocation quite well.
4. The views on equity in the literature

4.1 Definitions of equity presented by the papers and the relationship of equity and the term “fairness”

Equity can be a difficult concept to define, therefore, the literature was surveyed for definitions and the views on equity presented by the papers. It was important that views and definitions of equity were within the sphere or area of resource allocation, more specifically needs-based resource allocation. It was found that equity can be defined in many ways and at many different levels (such as macro or micro level, explained below). Mooney (1982) indicates that some of the common definitions of equity include “equal inputs for equal need, equal expenditure per capita, equal access for equal need and equal utilisation for equal need”. Each definition of equity requires a different methodology in the way equity is measured as well as in the way that equity or the respective definition is put into practice (Asante et al. 2006).

Needs-based resource allocation looks at needs at a macro level meaning that it takes into account the needs of the population in geographic areas and is not purely focused on the individual (micro level). Ensor et al. (2012) state however, that inequity at macro level may reflect inequity at the micro or individual level.

Consulting the literature, most authors maintained the view that that equity has to do with “fairness” in the allocation of resources (Birch and Chambers 1993, Zere et al. 2007 and Mooney 1982). In a literature review conducted by Guindo et al. (2012), on the factors that guide decision making by stakeholders on how resources should be allocated, the terms “equity” and “fairness” came up most often in the literature. Doyal (1995) therefore states that allocating resources on the principle of “fairness” would involve allocating resources on the basis of healthcare need. The interpretation of equity as “fairness” in the distribution of resources, based on need for healthcare, is used in this study.

4.2 The definitions of vertical and horizontal equity in the sphere of needs-based resource allocation

Generally, equity can be looked at in 2 ways; horizontal equity and vertical equity. In terms of horizontal equity “it is the equal treatment of equals” (Mooney 1982 and Zere et al. 2007) meaning that those with the same healthcare problems will be able to access the same type of healthcare and be treated in the same manner. In the case of vertical equity, it is “the unequal treatment of unequals” (Mooney 1982) meaning that those with different healthcare conditions would be able to access different types of healthcare services and thus be treated
differently.

Examining the literature, only 2 papers managed to put the concepts of vertical and horizontal equity into perspective, within the context of needs-based resource allocation. Birch and Chambers (1993) and Birch et al. (1993), state that horizontal equity would mean equal resources for populations (or communities) with equal need while vertical equity would mean unequal resources for populations (or communities) with unequal needs.

This relates well to the definition of needs-based resource allocation presented above. It would mean that if 2 geographic areas had exactly the same indicators of need (i.e. the same population size, the same morbidity and mortality or socio-economic status etc.) then both areas would receive the same amount of financial resources (horizontal equity). This would be due to their target shares being identical. If these geographic regions had different population sizes, morbidity, mortality and/or socio-economic status etc, then each would receive its financial resources proportionally to their share of need (vertical equity). This would be due to their target allocations being different to each other.

5. The concept of need in the literature

As in the case of equity, need is a difficult concept to define and measure. The objective of measuring need or allocating resources based on need is to improve the delivery of services (Asadi- Lari et al. 2003) in a given region. Allocating resources based on need aims to improve equity across geographic areas. Thus, it is important to understand views on need in the context of needs-based resource allocation.

Acheson (1978) describes 2 different approaches to viewing or defining needs. The first being the “humanitarian view” and the second being the “realistic view”. The humanitarian view involves concentrating on what is causing the need for healthcare but does not take the cost of addressing this need into account. The “realistic view” concentrates on the issue causing the need and finds a way in which to address it while taking into account the cost of providing care. It also aims to answer the question of what is feasible in trying to address the need for healthcare in a society.

The Donabedian model developed in 1974 is closely linked with the “realistic view” as described above. This model looks at a need and then translates this into service or resource equivalents that aim to satisfy the given need. Stone (1980) states that the objective of this model is to calculate a ratio of need to resources. This paper also gives a set of examples of possible resource
indicators and need indicators (demographics of a population, mortality rates and morbidity rates for example.) This model or view is the most closely related to needs-based resource allocation.

Mooney (1982) and Stevens & Gilliam (1998) show that measuring healthcare need is difficult and complex. However, using a comparative approach in the assessment of need is encouraged. This entails looking at the differences in need in different geographic locations, which is done by needs- based resource allocation as the allocations are made proportionally while comparing the healthcare need in one area relative to the other areas concerned.

In the sphere of needs-based resource allocation, proxies (or indicators) of healthcare need are used to give an understanding of the relative need within and across different geographic locations. This allows for the comparative approach to be put into practice. The section on the country experiences in this paper will give insight into the proxies of need that countries have used in needs-based resource allocation studies.

Equity and need are interrelated within the context of resource allocation. Doyal (1995) suggests that 7 principles should be adopted if the view of equal access for equal need is adopted. Of these 7 principles, 4 are linked closely to needs-based resource allocation. Firstly resources should be allocated according to relative need (for this reason proxies of need are used to show geographical differences in need), secondly, areas with greater healthcare need should receive proportionately a greater amount of resources, thirdly if the needs of 2 areas are the same then equal resources should be awarded to both of these areas and thus keep to the principle of fairness and finally, resources should not be allocated or used in such a way that they are not wasted (thus taking into account absorptive capacity of geographic areas.)

6. Needs-based resource allocation formulae in the literature produced by the search

This section will examine needs-based resource allocation formulae found within the literature search. The literature is analysed taking each country’s experience into account. The aim in this section is to analyse the formulae using 3 themes: The formula construction; the indicators of need found in the formula and the appropriateness of the indicators in terms of it being good proxies for healthcare need; and finally if the formula had any effect on equity in the event that the need-based resource allocation formula was utilised. Following this, there will be a section on key lessons from these papers that should be taken into account when implementing a needs-based formula. Some papers deal with advocating for needs-based approach in certain
countries while other papers detail the experience of countries that have implemented the needs-based methodology.

6.1 Developed countries

6.1.1 The United Kingdom

The most well-known and successful needs-based resource allocation approach is that of the United Kingdom. The literature search produced a few papers on the UK experience, detailing the formula creation as well as the implementation of the formula. RAWP implemented needs-based resource allocation in the early 1970s. Mays (1987) reviews the needs-based formula in a simple manner by stating that it was a formula based on population size weighted for demographic composition (age-sex groupings) and a proxy for morbidity (as expressed by the Standardised Mortality Ratio or SMR). The RAWP formula went under scrutiny because of this, as a strong relationship between mortality and morbidity was not found to exist at the time of formula implementation. This meant that while people did become ill some recovered and, therefore, did not die because of the illness. Mays (1987) however does express that accurate direct morbidity data was not available at the time and that the available data sets were incomplete and were thus not used.

Smith (2008) explains the reasons for the indicator choice and also gives details on how certain indicators were calculated. RAWP used four main indicators. The first indicator being population size of geographic areas. The second being age and sex to bring about the differences in healthcare need that would be showed by demographic differences and not population size alone. This was achieved by weighting each age-sex group for the national average utilisation of healthcare services (inpatient days and outpatient visits) for that group. The third indicator was the SMR; Smith (2008) defines SMR as “the number of observable (or actual deaths) in a geographic area expressed as a percentage of expected deaths in the area given the demographic composition of the area”. The fourth and final indicator was the differential costs of service input, particularly what was called the ‘London weighting’ to account for the higher salaries paid to NHS staff working in London. The RAWP formula was later revised to include a measure of socio-economic status; as there is a strong relationship between socio-economic status and ill-health, this was seen as a way of addressing the deficiencies of mortality measures noted above (Department of Health Financial Planning and Allocations Division 2011 and Department of Health and Social Security 1988).

Another important element of the RAWP experience was the use of explicit ‘ceilings’ and
‘floors’ on annual budget changes to guide the pace of change. A ceiling of 5% real growth in a region’s budget over the previous year’s allocation and a floor of a 2.5% reduction in real budget were set (Department of Health and Social Security 1976).

Winyard (1981) examined the effectiveness of RAWP 5 years into its implementation. It was found that the target for budget growth ‘the ceiling’ of 5% was not followed, but did mention that this is dependent on the absorptive capacity of the geographic areas. This is an important message in terms of the implementation of a needs-based formula. The absorptive capacity should be monitored carefully and the ceilings and floors should be adjusted accordingly (Judge & Mays 1994). The UK was successful in achieving equity in resource allocation over a 15 year period (Smith 2008) using the RAWP formula. Hendry (1998) states that the introduction of the RAWP formula brought equity into the objectives of the National Health Service for the first time and the slow pace of change was key to the success of RAWP, as it allowed for manageable annual budgetary changes. McIntyre and Anselmi (2012) gives further insight into the factors that contributed to the success of RAWP: firstly each region was relatively close to its equity target before the implementation of the formula when compared to many other countries which face far greater inequities in the distribution of resources (this helped in achieving equity in a shorter time frame); secondly, there was a real increase in the overall health budget each year; and finally, the budgets of the over-resourced districts were kept constant while the under-resourced districts received their increases from the real budget increase (i.e. there were no absolute budget cuts in over-resourced geographic areas). Although the implementation of needs-based resource allocation formulae in the UK was successful and contributed to improvements in equity, some inequalities still exist.

6.1.2 Australia

Hindle (2002) describes the Australian (New South Wales) needs-based resource allocation experience and speaks of its success. Australia has 3 resource allocation formulae: the first being an input-based formula (for specific service providers) which allows for the input of estimated cost per episode of illness; the second is an output-based formula that is based on case-mix methodology where healthcare centres are paid as they treat specific illnesses; and the third model is a needs-based resource allocation formula. This is known as the Resource Distribution Formula. The focus in this review will be on this needs-based formula.

This formula undergoes review each year and is therefore refined when the need arises. The quest for developing a needs-based formula began when the UK started using this approach in
the 1970s. In 1998 the first formula was put into action; this formula took into account indicators of need such as age-sex composition and mortality rates as a means to adjust for the per capita variations in healthcare need. In 2003 this formula was updated to include indicators such as a composite index called the Generic Need Index (the aim of this index was to take into account the variations in health need that age-sex groupings would not). The Generic Need Index consists of 3 indicators: an indirect SMR; a socio-economic indicator developed specifically for the formula; and an indicator of rurality. The indirect SMR is calculated by applying the age-sex specific death rates to the population data. The rurality indicator uses defined categories of rurality, for example, the areas that are defined as ‘more rural’ by determining the distance to the referral or base hospitals in the given area. This indicator also looks at ‘land use’; for example farming areas would be defined as 40% of its population being employed in the farming industry. It is interesting to note that when examining these indicators against utilisation, the rurality indicator was seen as the best single indicator of utilisation of health services with the indirect SMR coming in at second (hence the importance of including socio-economic indicators in needs-based formulae). Therefore, the poorer the area the greater the utilisation of healthcare services would be. The Generic Need Index is utilized in allocating resources to 5 of the 9 healthcare services in the Resource Distribution Formula. These services are: emergency, acute inpatients, outpatients, population health and primary and community based services.

6.1.3 Scotland

The Information Services Division, NHS National Services, (Information Services Division Scotland 2010) website describes that the NHS Scotland Resource Allocation Committee (NRAC) formula was accepted in 2008 and was used for resource allocation in 2009/2010. This site has 2 documents describing the formula in great detail. These documents are entitled ‘How the NRAC formula works in practice’ (2010) and ‘frequently asked questions’ (2010). The NRAC formula consists of 4 components namely: the population size of each area (as the most important indicator); the age-sex composition of each area; the additional needs due to morbidity and life circumstances (MLC indicator); and finally the unavoidable excess cost of delivering care in different geographic locations. The age-sex groupings are created after which the national average per capita cost are applied by age-sex group for each of the specific programmes. The NRAC understands that the importance of applying demographic information lies in the fact that it makes the formula more responsive to the differences in utilisation of healthcare services by each age group; for example, the elderly population (above 65 years of age) requires more care than those below this age. The MLC indicator takes into account that
areas with higher deprivation or higher morbidity levels will require more care and, therefore, this indicator tries to move resources towards these areas. Finally, the excess cost of service supply index examines the extra costs of providing care in rural versus urban areas, with the understanding that it costs more to deliver care in rural areas. This is done by giving a higher weighting to rural areas where there are greater costs in delivering healthcare.

6.1.4 Canada

Birch et al. (1993) advocated for the Canadian health system to move towards a needs-based approach. This was so that resources could be allocated in such a manner that was free from the past approach which took the usage of services and the services provided by providers into consideration. Resources would therefore be allocated according to the relative level of need expressed across geographic locations using a population-based approach. It was suggested that an equal per capita formula be examined (although it would not take into account differences in indicators of need other than total population size across geographic areas). To take variations in healthcare need into account, this formula would need to weight for different factors namely; demography, health risks and relative costs of providing care.

Birch and Chambers (1993) then considered other formulae, starting by taking into account the current budget for each of the different health programmes offered and the population size of each geographic area. This was then weighted for age-sex groupings in each geographic area. Following this, the resulting target shares were then weighted for health risk (SMRs- the number of deaths that occurred in the population 64 years of age and below from 1979 to 1988). The SMR was used for most healthcare programmes. Therefore, the study produced 3 potential formulae 1) an unweighted per capita formula, 2) a per capita formula weighted for age-sex groupings and 3) a per capita formula weighted for age-sex groupings and health risk. The target allocations for each programme for each of the geographic areas were summed up to give the total target allocation of each respective area.

6.2 Developing countries

6.2.1 Pakistan

Green et al. (2000) detail the efforts made in Pakistan to develop a needs-based approach to resource allocation. This approach was advocated for, but due to there being little political support for this approach to be implemented and key stakeholders having little faith in the available population data; the formula has not been implemented. The aim of the formula was
to move away from historical budgeting. The proposed needs-based formula would have been a per capita formula based on possible indicators of healthcare need such as age-sex composition, socio-economic status and specific healthcare needs of populations. The paper was not specific on what indicators would be used for socio-economic status or specific healthcare needs. However the authors indicate that the reason why indicators of socio-economic status or deprivation are of importance is that geographic areas with a higher level of deprivation or lower socio-economic status will reflect higher expected healthcare need as well as higher morbidity and mortality, and a higher cost of providing care in these areas.

6.2.2 Malawi

Manthalu (2010) investigates the effect of using a composite or simple index (stunting) of socio-economic status, as an additional indicator of healthcare need in a needs-based formula in Malawi. This paper details the gradual introduction of needs-based formulae in Malawi. In 2001, the resource allocation formula was based solely on the population size of geographic areas (districts). The 2007/2008 formula had the population size of districts weighted for stunting as an indicator of socio-economic status (this was expressed as the “percentage of children under the age of 5 whose height-for-age fell below minus 3 standard deviations of the height-for-age of the standard population”). Research conducted by the author showed that stunting was a good indicator of overall socio-economic status of a population. Therefore, populations with higher socio-economic status would have lower percentages of stunting. This formula was tested by removing stunting and replacing it with a composite index (Asset index to indicate socio-economic status). Asset indices are much easier to collect than income indicators and the authors indicate that the use of asset indices and deprivation indices have often been used in other needs-based studies. The outcomes showed that neither of the indicators was more statistically significant than the other. However, the simple indicator would be easier to use and collect, highlighting the benefit of using a single reliable indicator.

6.2.3 Indonesia

Ensor et al. (2012) advocate for a prevalence costing approach to needs-based budgeting in Indonesia. This study was unique in the sense that it used a costing methodology for a services package (maternal health and communicable diseases). The authors recommend this approach be used when there are few services that are offered in a country as part of a set service package. The costing methodology entailed working out the cost per episode of each selected disease. This is referred to as a bottom-up approach to costing. The costs of providing these
services were modelled on an average or ‘typical’ province in Indonesia, following which this was weighted for age-sex composition, the proportion of the population suffering from each disease and the distance from the health service facility to the hospital that a patient may be referred to, if necessary. These factors brought out the differences in each district’s healthcare need. The cost for providing care takes into account the proportion of the population that is suffering from the disease(s), the proportion of the population that may present with the disease(s) in the future and the proportion of the population that requires treatment at healthcare centres for the disease(s). Therefore the focus on this approach is the prevalence of each disease in each area's population.

6.2.4 Namibia

Zere et al. (2007) advocated for a needs-based resource allocation formula to be implemented in Namibia as a means to move away from the historical or incremental budgeting mechanism used at the time. It was found that areas with lower socio-economic status were receiving less their fair share of resources. This is in line with the inverse care law, which can be seen in many developing countries. This law states that “the availability of good medical care tends to vary inversely with the need for it in the population served” (Hart 1971). Hence, a formula was developed in which population size was weighted by the normalised asset index that the authors created using Principal Component Analysis. The authors state that the asset index was developed due to the lack of household income and expenditure data. The study revealed there was inequity in per capita spending across geographic areas and that those districts with lower socio-economic status were further away from their equity targets, and were therefore receiving less than their fair share of resources.

6.2.5 Zambia

Chitah and Masiye (2007) examine the Zambian experience in the development and implementation of needs-based formulae. Prior to 1993, Zambia used historical budgeting as a means of resource allocation to district level. Following this, a formula that was based on population size was utilised with the aim of improving per capita allocations. This formula was used as a transition formula while other criteria for needs-based proxies were being developed. In 2004, the addition of a socio-economic indicator was proposed and adopted. A deprivation index was developed and selected as the proxy of healthcare need. The resulting formula was population size adjusted for the deprivation index. While the use of morbidity and mortality indicators were suggested, no accurate data of this nature existed, particularly with little death
reporting in rural areas. It was suggested that the formula effectiveness be monitored over time and be refined by the use of a number of selected indicators, for example, the demographic composition of the populations and the maternal mortality rates.

6.2.6 Chile

Vargas and Wasem (2006) advocate for a risk-adjusted capitation formula in Chile as they believe that the capitation formula at the time failed to take into account the needs of the poorer populations with lower socio-economic status. The authors suggest that the capitation formula be adjusted for age and sex (as demographics is the most frequently used proxy to adjust population size to show differences in healthcare need) and taking into account 2 morbidity indicators related to Diabetes and Hypertension (particularly the number of consultations for each of these illnesses). The number of consultations was seen to reflect the usage of healthcare resources associated with the disease. Hypertension and Diabetes caused high rates of morbidity and mortality in Chile, hence the selection of these 2 diseases.

7. Key messages from literature when selecting proxies of healthcare need and implementing needs-based resource allocation formulae

7.1 Indicator selection

While there is no gold standard in indicator choice, the choice of indicators will have different outcomes when used in a needs-based approach (Kephart & Asada 2009), thus influencing directly how resources are allocated. It should be understood that the indicators chosen should reflect healthcare need, by using data that is currently available in order to make progress in terms of equity. Mathalu (2010) importantly recommends selecting indicators that are simple and easy to collect.

The starting point and most valuable indicator is population size (Zere et al. 2007); this can be seen in the above literature as every study has used this indicator. This indicator is generally given the highest weighting in a needs-based formula as geographic areas with higher population numbers relative to others would need more financial resources to provide healthcare to the population. It has been suggested that a needs-based formulae based only on population size can be a starting point and the indicators that follow be used to refine the formula over time. Cooper (1975) in McIntyre and Anselmi (2012) argues “in the absence of any reliable or accepted indicator of need, per capita equality would appear a more rational
goal than the perpetuation of historical chance.” Therefore, if resources were allocated on a per capita (per person) basis in a data poor setting it would still be a step in the right direction in achieving equity in resource allocation.

The second most common indicator is the demographic composition of each geographic region. This data is important as the 4 population groups that require the most care are infants, children below the age of 5, the elderly population (above the age of 60) and women of childbearing age, compared to the rest of the population in these areas (McIntyre 2007 and McIntyre and Anselmi 2012). Therefore, areas with higher proportions of these individuals would require more healthcare resources to provide care. In order to estimate the magnitude of relative need for health services due to demographic composition, the number of people in each age-sex group in each district or region must be multiplied by the average national utilisation rates for that age-sex grouping.

Morbidity data may be used as an indicator of healthcare need. These are seen as direct measures of sickness and healthcare need (Chitah and Masiye 2007). However, the issue relating to this proxy is that a single morbidity indicator is unlikely to reflect healthcare need across all geographic areas as it would only reflect healthcare need based on a single illness. If the morbidity indicator selected is endemic in some areas but not others, such as malaria, this could create a very skewed perspective on the distribution of ill-health. If a single morbidity indicator is used, then a low weighting should be given to this indicator. An alternative would be to use mortality indicators (such as infant, children under 5 or maternal mortality) as a proxy for overall morbidity in a geographic area. This data can be obtained from household surveys and if conducted on a yearly basis will yield timely and accurate data. There are issues around the reporting of maternal and infant deaths through vital statistics registration mechanisms, especially in rural areas in developing countries, therefore, this type of data may not be available for use in the formula. In Vargas and Wasem (2006) stakeholders were asked to select morbidity related indicators and it was agreed that the criteria in the John Hopkins Ambulatory Care Group methodology be used. The 4 criteria are: the selected disease should be recurrent or a chronic disease; the disease should be stable and require constant financial resources; the disease should have a high probability of requiring specialised care; and finally the disease should require a diagnostic appraisal. All four or, at least, some of these criteria could be of use when given the opportunity to select morbidity indicators, should the need arise.

Socio-economic indicators are used in some studies as there is a strong positive relationship
between poor socio-economic status and high levels of morbidity and mortality. These populations are also more dependent on public sector resources, and therefore public healthcare (McIntyre 2007). As a result, geographic areas with lower socio-economic status would require more resources to provide care. There are 2 approaches to the collection of this type of data as seen above in the Malawi study; a simple indicator of socio-economic status can be used if it is backed up by literature or the more common approach is the utilisation of a composite index of socio-economic status. Composite indices are often created by Principal Component Analysis, whereby a variety of indicators identified as being important in the literature are used to create a single index. Data for the indicators are mostly taken from household surveys. The most common option for a composite indicator of socio-economic status is the asset index as this is easier to collect than an indicator based on income. Asada et al. (2012) advocates for the addition of a socio-economic indicator in needs-based formulae. This study showed that when examining the resources allocated based on need, while viewing the population through the lens of socio-economic status, the poorest population was in greater need of more healthcare resources.

While some studies do take into account the cost of providing care, it is important to understand which areas require more funds for providing care and the reason for that need. For example in the UK experience, the urban areas (specifically central London) required more funds to provide the same care as compared to the less urban areas. This was due to cost of living in central London being higher and thus healthcare providers needed to be paid more to live and work in central London. However in most developing countries, the inverse of this scenario is seen, such that rural geographic areas require more resources to deliver care than urban geographic areas. This is due to the fact that it would cost more to deliver a unit of care in a rural area than an urban area, for example the same supplies would cost more to be transported to rural areas due to vast distances. Eyles et al. (1991) suggest this to be an important indicator as delivering care in rural versus urban areas would cost more due to transport costs incurred when delivering care in rural areas. Also, in terms of staffing, most clinical staff are reluctant to work in rural areas due to the lack of infrastructure, therefore rural staff are paid extra or given incentives. The addition of this indicator is not always necessary (if costs are very similar across geographic areas) and may not always be possible due to data of this nature not being available; therefore it should be seen as an indicator to be added for formula refinement if the opportunity does arise.

Once the proxies have been selected, the mathematical formula is created weighting each
indicator or proxy differently. The formula with the different inputs (proxy indicators and weightings) then gives each geographic area its respective equity target allocation. The target allocation is the amount that each geographic area should receive in order for the available resources or budget to be allocated equitably across all geographic areas. In this way, resources are allocated to one geographic area based on its relative need compared to the other geographic areas relative proportion of need (as shown by the respective target allocations). Geographic areas that are above their target allocation are seen as over-resourced and those districts that are below their target allocation are seen as under-resourced. The goal is for the budget of each area to gradually move towards its respective equity target allocation.

7.2 Implementation

It is suggested that in settings where data quality is low, the formula created for resource allocation should be a simple one and as data quality improves indicators should be added to the formula to refine it (Green et al. 2000). This means that even if the needs-based formula is based on a few reliable indicators of need, such as population size, it will be a step in the right direction in terms of trying to achieve equity in resource allocation. Green et al. (2000) also bring to the forefront that having political buy-in from stakeholders is vital in terms of implementation, not only in terms of the use of a needs-based resource allocation approach but also in terms of indicator or proxy selection. Green et al. (2000) and Zere et al. (2007) place emphasis on the need for timely and accurate data as an important factor in implementation. Both Mathalu (2010) and Green et al. (2000) show that a gradual introduction of a needs-based formula is the best approach and as more accurate data becomes available these indicators can be added to the existing formula and the possible effects can be modelled.

From an implementation perspective, it is important to work with stakeholders to decide by what percentage each under-resourced geographic area’s budget may increase each year (the ceiling) and by what percentage each over-resourced geographic area’s budget may decrease each year (the floor) (Department of Health and Social Security 1976).

The time frame within which equity is to be achieved is also decided. These factors determine the pace of change. It is important to monitor the absorptive capacity of the under-resourced geographic areas (this is the ability of these geographic areas to utilise these additional resources in an effective manner, for example by employing more staff etc). Such monitoring is vital as excess resources should not be given to a geographic area that does not utilise it effectively (McIntyre and Anselmi 2012). Ceilings and floors and the time frame for resource
redistribution can be adjusted accordingly.

Another factor leading to a successful implementation of the needs-based approach would be taking into account whether or not there is a real increase in the health budget each year, as a real increase in the overall budget means that the budgets of over-resourced geographic areas can be kept constant while the under-resourced geographic areas can receive their increases from the real yearly increase. This would allow for there to be no absolute budget cuts of the over-resourced geographic areas to fund the under-resourced areas. This is also an option that is more likely to be accepted by stakeholders, as if absolute budget cuts are likely to occur then stakeholders from the over-resourced geographic areas would not agree to the implementation of the needs-based approach. An example of this can be seen in the case of Zambia (Chitah and Masiye 2007); stakeholders in the over-resourced districts were unhappy as they experienced fast and sudden budget cuts to fund the under-resourced districts (this also had a direct impact on service provision in these areas). It was therefore suggested that the total increase in the health budget be taken into account and that the formula be implemented gradually over a longer period of time. Slow implementation over a number of years is a key factor for needs-based resource allocation to be successful.

8. Gaps in Research

Many of the papers did not deal with the issues surrounding the implementation of needs-based resource allocation methodology and thus, this may be an objective for further studies in this area. It is important to understand that these issues can only be explored if the needs-based approach has been implemented or by examining countries who have implemented this methodology. For example, other factors relating to needs-based resource allocation that have a direct influence on equity include the absorptive capacity of areas to utilise the new resources, the availability of human resources for healthcare, donor funding and the political influence on how resources are allocated (Asante & Zwi 2009).

Attention has been given to needs-based resource allocation over larger geographic locations such as provinces. Not much attention has been given to the small geographic areas within these larger regions (Asante et al. 2006). Therefore, while inter-provincial inequity does exist in terms of resource allocation, inequity also exists within the districts of provinces. This is a gap in research that this study chooses to focus on; inequity in resource allocation at district level and the creation of needs-based resource methodology for district level allocations. There is relatively limited peer-reviewed literature on the equitable allocation of health care
resources in South Africa, and that which does exist has focused on allocation between provinces rather than between districts. Stuckler et al. (2011) call for better information on healthcare need in South Africa and states that areas that are in need of greater resources (and that have greater disease burdens) seem to be receiving less resources. Sanders & Chopra (2006) also state that focus should be placed on a methodology that ensures equity in the distribution of resources for healthcare in South Africa. This study will therefore contribute to knowledge on needs-based resource allocation in developing countries (specifically South Africa) and examines this approach focusing on smaller geographic areas (districts within a selected province of South Africa).
9. References


PART C: Manuscript

(As per the South African Medical Journal guidelines for manuscripts)
Abstract

Background: Inequity in resource allocation and expenditure exists within the South African healthcare system at provincial and district level. Needs-based resource allocation has been utilised in developed and developing countries to promote equity.

Objectives: The objectives of this study are to document stakeholder views on equity in the allocation of healthcare resources; to assess current spending patterns on Primary Healthcare (PHC) level care at district level, and ultimately, to promote equity in district PHC spending by using a needs-based resource allocation approach.

Methods: This study uses both qualitative (interviews with stakeholders to select indicators of need) and quantitative data (PHC current total budget and expenditure from 2009/10 to 2013/14 from the Vulindlela system). The interviews were recorded, transcribed and underwent manual thematic analysis. Trends in provincial and district PHC expenditure were analysed. Data for the needs-based formula were taken from various sources published online.

Results: The analysis produced 4 possible needs-based formulae. Calculations show that in the North West province, Bojanala and DR K Kaunda are relatively under-resourced while NM Molema and RS Mompati are relatively over-resourced. It is recommended that a relative redistribution of resources be undertaken over several years, preferably in the context of an annual increase in the real overall provincial PHC health budget, to avoid any absolute budget cuts for relatively over-resourced districts in moving towards each district’s equity target.

Conclusion: Inequity in PHC expenditure does exist between the districts of the North West. A needs-based resource allocation approach can contribute to promoting equity across districts.
Introduction

Current healthcare financial resource allocation in South Africa is largely based on historical budgeting, meaning that provincial and district health budgets are allocated based on past expenditure patterns, adjusted for inflation. This has preserved historical inequities in resource allocation in South Africa. These historical inequities exist between provinces as well as districts. The focus of this study is the inequity that exists (in terms of primary healthcare or PHC expenditure) between the districts of the North West province. The North West province has 4 districts: Bojanala, NM Molema (NMM), RS Mompati (RSM) and DR K Kaunda (KK).

The literature demonstrates that using a needs-based resource allocation approach can promote equity in resource allocation between geographic locations.\(^{(1-2)}\) This approach was first utilised in the UK in the 1970s\(^{(3)}\) and has since been used in many developed and developing countries\(^{(1,4-6)}\). While there has been some discussion on needs-based resource allocation in South Africa, this approach has not been formally adopted for the allocation of healthcare funds.

Needs-based resource allocation entails using indicators of healthcare need (such as population size, disease profile, socio-economic indicators and demographic composition of populations in different geographic locations) to create a needs-based formula. These formulae produce what is known as the ‘target equity allocation’ for each geographic area, such as a district. The target equity allocation (or target expenditure shares) provides a guide for the future allocation of resources to each district. Other important factors in a needs-based study are pace of change (rate at which resources are redistributed across districts and the timeframe selected) and the absorptive capacity (the ability of a district to utilise additional resources in an effective way).

The aim of this study is to assess the current distribution of spending on district primary health care (PHC) services and to explore ways of promoting equitable spending on PHC level services across districts in the North West province by using a needs-based resource allocation approach.
Methods

This study has a qualitative and quantitative component. For the qualitative component stakeholders were interviewed to ascertain their views on 3 key themes namely; equity, needs-based resource allocation and appropriate indicators of need. The quantitative component entailed finding appropriate, reliable and accurate data sources for each indicator of need used in the formulae construction as well as obtaining and compiling financial data.

Selection of stakeholders and the interview process

A total of 23 stakeholders were interviewed (11 at district level and 12 at provincial level). Managers of different categories, mid to senior level management were interviewed. The diversity in stakeholder selection resulted in rich data and a holistic view on the themes discussed. After stakeholders signed an informed consent form, interviews were recorded and then transcribed. Transcripts were analysed manually for the 3 themes mentioned above.

Secondary data collection and sources of data

Financial data

Financial data (2009/2010 -2013/2014) was downloaded directly from the provincial financial management information system, Vulindlela. The 2 data sets examined in this study included the actual district PHC Expenditure figures for 2013/2014 and the total PHC budget for each year (from 2009/2010 to 2013/2014). All financial data was analysed in real 2013/2014 terms; therefore all data presented in the tables below are expressed in 2013/14 real terms.

Population and demographic composition data

District level population data (disaggregated into age-sex groupings) was derived from the ‘Population by gender, age, and race’ content table from the HIS Global Insight Regional Explorer database. The district data was made to match the age and sex groupings as per the utilisation rate data.

Utilisation data

National outpatient utilisation rates for clinics/community healthcare centres (PHC level services) for each age and sex grouping were drawn from the SACBIA survey that occurred in 2008. The key age groups that require more care, and thus have higher utilisation rates, are individuals above 60 years of age, infants below 5 and females of child bearing age (15-49
years).

**Morbidity data**

The morbidity indicator was the district antenatal HIV prevalence data drawn from the 2011 National Antenatal Sentinel HIV and Syphilis Prevalence Survey in South Africa\(^9\).

**Deprivation Indices**

Deprivation indices, as a measure of socio-economic status, were drawn from the 2007/2008 Health Systems Trust District Health Barometer\(^10\). These figures were available at district level and were the latest figures available in South Africa.

**Methodology for needs-based formulae calculations**

The methodology for needs-based formulae calculations was taken from a report by McIntyre and Anselmi\(^11\). It involves weighting population size data for the different indicators of need. The first step involves disaggregating the district population data for age and sex groupings. In the second step, national utilisation rates are then normalised; this involves finding the lowest utilisation rate and then dividing each of the utilisation rates (for each age and sex grouping) by this value. The population weighted for demographic composition and utilisation is therefore calculated by multiplying the population size of each district age-sex grouping by its respective normalised utilisation rate. The final step calculates each districts percentage share of the total available resources (or provincial resources). This is done by calculating the percentage share of each district’s weighted population of the total. As indicators are added to create new formulae, the same approach is used, except now the normalised indicator will be multiplied by the total district population of the respective district. Districts that are above their target allocation are relatively over-resourced, while districts that are below their target allocation are relatively under-resourced. Microsoft Excel (2010) was used to analyse and create the needs-based formulae and graphs.

**Results and discussion**

**Qualitative data Analysis**

**Stakeholder’s view on allocating resources equitably**

All stakeholders agreed that equity does not guide decision making in resource allocation in the province at present and agreed that resources should be allocated equitably across districts, but that these allocations should be based on a set of explicit guidelines or criteria. Examples
of criteria given during interviews were in line with the common indicators, suggested by literature. Among others, social-determinants of health and the rurality of a district were suggested. The number of clinics was also suggested (meaning a district with a greater number of clinics would need a greater amount of resources). This is not an indicator of need but rather of existing supply.

**Stakeholder views on the indicators of need and their suggested indicators**

All stakeholders agreed that population size, demographic composition and burden of disease are important indicators while most stakeholders believed that differing cost of providing care in rural areas and socio-economic status of the population in a district are important indicators.

A few stakeholders suggested more emphasis be placed on the uninsured population of each district as this sector of the population is dependent on the public healthcare system. Socio-economic indicators suggested were in line with the Deprivation Index used. HIV prevalence was the most frequently suggested morbidity indicator. Stakeholders suggested that the 2011 National Antenatal Sentinel HIV & Syphilis Prevalence Survey in South Africa be used as the morbidity indicator in the study as ‘...it uses scientific methods unlike using routine data which has got a major flaw’ (Interview 17).

**Quantitative data analysis**

**The needs-based formulae**

Figure 1 compares each district’s percentage share of 2013/14 PHC expenditure with their equity target allocations using different needs-based formulae. Formula 1 uses population size of districts as the only indicator of need. The 2013 data showed that Bojanala has the highest population size (43% of the North West population) and that RSM has the smallest population size (13%). This is thus reflected in the percentage target allocations in formula 1 in Figure 1. Formula 2 utilises population size and the age-sex composition of each district’s population, weighting for utilisation. Formula 3 uses the same indicators but adds HIV prevalence to the formula (with a weighting of 20%). Formula 4 uses the same indicators and adds a deprivation index (weighted at 20%) as an indicator of socio-economic status. Regardless of the formula or indicator choice, the trend in the percentage share of target allocations from highest to lowest are as follows; Bojanala, NMM, KK and RSM. Formula 4 was used for the purpose of analysis in this paper.
Figure 1: Percentage share of actual 2013/14 PHC expenditure compared to the percentage share of target allocations using different formulae

The effects of increasing the weightings of indicators

Giving HIV prevalence and the deprivation index a low weighting is recommended as HIV prevalence is only one indicator of morbidity and is an indicator of a single disease and the deprivation index is only one of many possible indicators of socio-economic status.

Figure 2 shows the impact of using a 20% weighting for HIV and deprivation index relative to a 100% weighting. In the case of the 100% weighting, Bojanala’s percentage share increases by 4%. NMM remains constant and RSM and KK’s percentage shares each decrease by 2%. It is important to note that 1% of the district PHC resources amounts to nearly R24 million.
Figure 2: The impact of different formula weightings on district percentage share of equity target allocations

Issues relating to pace of change

The establishment of needs-based formulae and equity target allocations for each district is the first part of the process. The second and equally important part are the issues relating to the pace of change; these include the time period for moving to the equity targets, which impacts on the annual changes in budget allocations. One scenario would be where there is no real increase in the total PHC budget (i.e. the real budget would stay constant at R 2 392 698 644 with only an inflation adjustment). This would mean that relatively over-resourced districts would experience real budget cuts to increase budgets for relatively under-resourced districts. In reality this is an extremely difficult task as relatively over-resourced districts will find it difficult to cope with a decrease in budget each year. This option is therefore unlikely to be accepted by stakeholders.

Figure 3 below looks at the average annual percentage increase or decrease in district budgets if equity is achieved in a 5 year or 10 year period, using a static real budget. The average annual percentage budget increase or decrease for each district is twice the amount if re-allocation happens over 5 years compared to the 10 year process. Therefore if re-allocation occurs over a shorter period of time, these increases or decreases are much greater and districts may find it difficult to cope with the loss or increase of these funds. If there is a static real budget, it is advisable for re-allocation to occur at a relatively slow pace. Monitoring of how resources are
absorbed or utilised in districts receiving budget increases should be a key objective.

Scenario 2 takes into account a real average annual increase in total district PHC budget. Analysis of total PHC budget (from 2010/2011 to 2013/2014) showed an average annual increase of 8% in real terms each year. If it is assumed that the real budget for PHC services continues to increase by 8% each year, then the alternative to the above option would be to keep the budget of over-resourced districts (NMM and RSM) constant in real terms (meaning that these districts receive the same amount as the previous year but adjusted for inflation), until they reach their respective equity target allocations. The budgets of under-resourced districts (Bojanala and Dr K Kaunda) would increase in real terms yearly using the funds from the real increase in the budget (the 8%). Figure 4 below depicts the movement of each district’s budget from the current share towards the equity target percentage share. Table 1 shows the Rand value that corresponds to each of the bars in Figure 4. These values are expressed in Rand million. The row labelled Total takes into account the 8% increase in the budget as discussed above.
Figure 4: The movement of each district’s budget towards the respective equity share

Table 1: The movement of districts budgets towards equity target allocations. Expressed in real 2013/14 terms Rand (millions)

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</tr>
</thead>
<tbody>
<tr>
<td>Bojanala</td>
<td>741</td>
<td>894</td>
<td>1 059</td>
<td>1 215</td>
<td>1 360</td>
<td>1 511</td>
<td>1 671</td>
<td>1 820</td>
</tr>
<tr>
<td>NM Molema</td>
<td>701</td>
<td>701</td>
<td>701</td>
<td>724</td>
<td>772</td>
<td>832</td>
<td>899</td>
<td>972</td>
</tr>
<tr>
<td>RS Mompati</td>
<td>493</td>
<td>493</td>
<td>493</td>
<td>493</td>
<td>493</td>
<td>493</td>
<td>493</td>
<td>517</td>
</tr>
<tr>
<td>DR K Kaunda</td>
<td>456</td>
<td>494</td>
<td>536</td>
<td>580</td>
<td>629</td>
<td>678</td>
<td>731</td>
<td>789</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>2 392</strong></td>
<td><strong>2 584</strong></td>
<td><strong>2 790</strong></td>
<td><strong>3 014</strong></td>
<td><strong>3 255</strong></td>
<td><strong>3 515</strong></td>
<td><strong>3 796</strong></td>
<td><strong>4 100</strong></td>
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</tbody>
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Bojanala would need the greatest increase as it is furthest away from its equity target allocation while KK is already close to its equity target percentage share. Allocating resources in this manner using a PHC budget that is increasing in real terms is easier and more ethical as budgets from relatively over-resourced districts are not cut in real terms to fund under-resourced districts. This is therefore recommended and has a higher likelihood of being accepted by stakeholders.

**Sensitivity Analysis**

A sensitivity analysis was performed taking into account 2 factors, namely the estimated district population covered by private medical schemes and the estimated cost of providing care in...
rural versus urban areas. The estimated district private medical scheme coverage was taken from the District Health Barometer 2011/2012\(^{(12)}\) and the percentage of district population living in urban areas was taken from the North West Provincial Development Plan\(^{(13)}\). This was used to calculate the percentage of the population living in rural areas. The main reason for conducting the sensitivity analysis was to see the effect these factors would have on the equity targets of each district.

No accurate data was available on the cost of providing care in rural areas versus urban areas therefore crude assumptions were made. Thus calculations were performed looking at a 50% higher cost and a 100% higher cost in rural areas (in effect looking at what the percentage shares would be if the cost of providing services in rural areas was twice that in urban areas). The cost of providing care is an important factor to consider because providing care in rural areas is more expensive due to the costs of transporting medical supplies to far off areas and the rural allowances for rural healthcare workers.

Using the estimated private medical scheme coverage figures, the uninsured population size for each district was calculated. The district population covered by private schemes was calculated by multiplying the population size by the percentage of each district’s population covered by medical schemes. In this calculation, it was assumed that 80% of the medical scheme members reside in urban areas and 20% of medical scheme members reside in rural areas. Thus the rural and urban populations that were uninsured were calculated. The rural and urban uninsured population were used in the calculations regarding cost of care in rural areas.

Figure 5 below shows the outcome of the sensitivity analysis calculations. The percentage shares were calculated using 2013/2014 PHC expenditure, population size, the size of the uninsured population, and the different rural cost assumptions. It can be seen that the trend remains consistent meaning that Bojanala is furthest away from its equity share and KK is almost where it should be; both of these districts remain as relatively under-resourced. NMM and RSM remain as relatively over resourced districts. What is striking is that when the above factors are taken into account the percentage shares do not shift by a large amount.
Figure 5: Sensitivity analysis: The effect of the non-insured district population and rural cost of providing care on district target equity shares.

Limitations

It is advisable not to focus on a single disease as an indicator of the relative need for health services in different geographic areas. While a particular district may have a greater burden of ill-health due to one disease (e.g. HIV) than other districts, it may have a lower burden of ill-health than other districts in relation to other diseases (e.g. diabetes, malaria or hypertension). For this reason, it is preferable to use an indicator of overall burden of ill-health, such as all-cause mortality rates. However, it is difficult to obtain accurate mortality data at district level at present. The study was also not able to include accurate indicators relating to cost of providing care in different geographic locations.

As more reliable and accurate data sets become available the province may have the opportunity to add these indicators to the selected formula and to see the possible effects of different indicator choices and weightings. Needs-based formulae are not sufficient by themselves to achieve equity; the allocation of financial resources in line with equity targets must be supported by careful planning to absorb these resources effectively, such as through increased staffing etc.
**Conclusion**

This study shows that inequity in the allocation of PHC resource does exist at district level and that using a needs-based approach to resource allocation may promote equity.

The analysis of alternative needs-based formulae, including the sensitivity analysis, showed that the trend for resource allocation remains unchanged when different indicators are added to the formulae. Bojanala and KK are relatively under-resourced while RSM and NMM are relatively over-resourced. Bojanala is furthest away from its equity target and KK is relatively close to its equity target. Hence the direction in which resource allocation should take place is clear and defined. It would be recommended that efforts be made to maintain the average annual real increase of 8% in the total PHC budget, as reallocation of resources in this context does not call for absolute budget cuts in any district budgets.

The selection of formulae, indicators and weightings are to be made by the North West Department of Health. The selected formula will need to be refined over time using updated and accurate data. For example, if the formula is based purely on the basis of population size initially, the population data will need to be updated each year as the population size may be increasing at different rates in each district. The same would apply for the other indicators of need selected for the formula. Two priority areas for refining the formula over time include: firstly, finding the cost of providing care in rural versus urban areas as assumptions were used in this study; and secondly, accurate burden of disease indicators or an indicator of mortality, as this may be a better indicator of overall burden of disease in the province.

In terms of implementing a relative reallocation of resources between districts, district managers will need support from provincial managers to utilise the increasing resources in an effective manner (in the case of relatively under-resourced districts) and to cope with a decrease in budgets (in the case of relatively over-resourced districts). The absorptive capacity of districts should be monitored to inform decisions on the pace of change.
References


Appendix A: South African Medical Journal Author Guidelines for Manuscripts

Author Guidelines

Accepted manuscripts that are not in the correct format specified in these guidelines will be returned to the author(s) for correction, and will delay publication.

AUTHORSHIP

Named authors must consent to publication. Authorship should be based on: (i) substantial contribution to conception, design, analysis and interpretation of data; (ii) drafting or critical revision for important intellectual content; or (iii) approval of the version to be published. These conditions must all be met (uniform requirements for manuscripts submitted to biomedical journals; refer to www.icmje.org).

CONFLICT OF INTEREST

Authors must declare all sources of support for the research and any association with a product or subject that may constitute conflict of interest.

RESEARCH ETHICS COMMITTEE APPROVAL

Provide evidence of Research Ethics Committee approval of the research where relevant.

PROTECTION OF PATIENT’S RIGHTS TO PRIVACY

Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives informed written consent for publication. The patient should be shown the manuscript to be published. Refer to www.icmje.org.

ETHNIC CLASSIFICATION

References to ethnic classification must indicate the rationale for this.

MANUSCRIPTS

Shorter items are more likely to be accepted for publication, owing to space constraints and reader preferences.

Research articles (previously ‘Original articles’) not exceeding 3 000 words, with up to 6 tables or illustrations, are usually observations or research of relevance to clinical medicine and related fields. References should be limited to no more than 15. Please provide a structured abstract not exceeding 250 words, with the following recommended headings: Background, Objectives, Methods, Results, and Conclusion.

Scientific letters will be considered for publication as shorter Research articles.

Editorials, Opinions, etc. should be about 1000 words and are welcome, but unless invited, will be subjected to the SAMJ peer review process.

Review articles are rarely accepted unless invited.

Letters to the editor, for publication, should be about 400 words with only one illustration or table, and
must include a correspondence address.

*Forum articles* must be accompanied by a short description (50 words) of the affiliation details/interests of the author(s). Refer to recent forum articles for guidance. Please provide an accompanying abstract not exceeding 150 words.

*Book reviews* should be about 400 words and must be accompanied by the publication details of the book.

*Obituaries* should be about 400 words and may be accompanied by a photograph.

*Guidelines* must be endorsed by an appropriate body prior to consideration and all conflicts of interest expressed. A structured abstract not exceeding 250 words (recommended sub-headings: *Background, Recommendations, Conclusion*) is required. Sections and sub-sections must be numbered consecutively (e.g. 1. Introduction; 1.1 Definitions; 2. etc.) and summarised in a Table of Contents. References, appendices, figures and tables must be kept to a minimum.

*Guidelines exceeding 8 000 words will only be considered for publication as a supplement to the SAMJ; the costs of which must be covered by sponsorship or advertising. The Editor reserves the right to determine the scheduling of supplements. Understandably, a delay in publication must be anticipated dependent upon editorial workflow.*

**MANUSCRIPT PREPARATION**

Refer to articles in recent issues for the presentation of headings and subheadings. If in doubt, refer to 'uniform requirements' - [www.icmje.org](http://www.icmje.org). Manuscripts must be provided in **UK English**.

**Qualification, affiliation and contact details** of ALL authors must be provided in the manuscript and in the online submission process.

**Abbreviations** should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

**Scientific measurements** must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dl). Litres is denoted with a lowercase ‘l’ e.g. ‘ml’ for millilitres. Units should be preceded by a space (except for %), e.g. ‘40 kg’ and ‘20 cm’ but ‘50%’. Greater/smaller than signs (> and <) and 40 years of age’. The same applies to ± and º, i.e. ‘35±6’ and ‘19ºC’.

**Numbers** should be written as grouped per thousand-units, i.e. 4 000, 22 160...

**Quotes** should be placed in single quotation marks: i.e. The respondent stated: ‘...’ Round brackets (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.
**General formatting** The manuscript must be in Microsoft Word or RTF document format. Text must be single-spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes, with the exception of Tables).

**ILLUSTRATIONS AND TABLES**

If tables or illustrations submitted have been published elsewhere, the author(s) should provide consent to republication obtained from the copyright holder.

**Tables** may be embedded in the manuscript file or provided as 'supplementary files'. They must be numbered in Arabic numerals (1,2,3...) and referred to consecutively in the text (e.g. 'Table 1'). Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged. Tables must be cell-based (i.e. not constructed with text boxes or tabs), and accompanied by a concise title and column headings. Footnotes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || then ** †† ‡‡ etc.

**Figures** must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'. Figure legends: Fig. 1. 'Title...' All illustrations/figures/graphs must be of **high resolution/quality**: 300 dpi or more is preferable, but images must not be resized to increase resolution. Unformatted and uncompressed images must be attached individually as 'supplementary files' upon submission (not solely embedded in the accompanying manuscript). TIFF and PNG formats are preferable; JPEG and PDF formats are accepted, but authors must be wary of image compression. Illustrations and graphs prepared in Microsoft PowerPoint or Excel must be accompanied by the original workbook.

**REFERENCES**

References must be kept to a maximum of 15. Authors must verify references from original sources. *Only complete, correctly formatted reference lists will be accepted.* Reference lists must be generated manually and not with the use of reference manager software. Citations should be inserted in the text as superscript numbers between square brackets, e.g. These regulations are endorsed by the World Health Organization,[2] and others.[3,4-6] All references should be listed at the end of the article in numerical order of appearance in the **Vancouver style** (not alphabetical order). Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus. Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al. First and last page, volume and issue numbers should be given.
Wherever possible, references must be accompanied by a digital object identifier (DOI) link and PubMed ID (PMID)/PubMed Central ID (PMCID). Authors are encouraged to use the DOI lookup service offered by CrossRef.


**Other references (e.g. reports)** should follow the same format: Author(s). Title. Publisher place: publisher name, year; pages. Cited manuscripts that have been accepted but not yet published can be included as references followed by '(in press)'. Unpublished observations and personal communications in the text must not appear in the reference list. The full name of the source person must be provided for personal communications e.g. '{Prof. Michael Jones, personal communication}'.

**PROOFS**

A PDF proof of an article may be sent to the corresponding author before publication to resolve remaining queries. At that stage, only typographical changes are permitted; the corresponding author is required, having conferred with his/her co-authors, to reply within 2 working days in order for the article to be published in the issue for which it has been scheduled.

**CHANGES OF ADDRESS**

Please notify the Editorial Department of any contact detail changes, including email, to facilitate communication.

**CPD POINTS**

Authors can earn up to 15 CPD CEUs for published articles. Certificates may be requested after publication of the article.
CHARGES

There is no charge for the publication of manuscripts.

Please refer to the section on 'Guidelines' regarding the publication of supplements, where a charge may be applicable.

Submission Preparation Checklist

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

1. Named authors consent to publication and meet the requirements of authorship as set out by the journal.
2. The submission has not been previously published, nor is it before another journal for consideration.
3. The text complies with the stylistic and bibliographic requirements in AuthorGuidelines.
4. The manuscript is in Microsoft Word or RTF document format. The text is single-spaced, in 12-point Times New Roman font, and contains no unnecessary formatting.
5. Illustrations/figures are high resolution/quality (not compressed) and in an acceptable format (preferably TIFF or PNG). These must be submitted individually as 'supplementary files' (not solely embedded in the manuscript).
6. For illustrations/figures or tables that have been published elsewhere, the author has obtained written consent to republication from the copyright holder.
7. Where possible, references are accompanied by a digital object identifier (DOI) and PubMed ID (PMID)/PubMed Central ID (PMCID).
8. An abstract has been included where applicable.
9. The research was approved by a Research Ethics Committee (if applicable)
10. Any conflict of interest (or competing interests) is indicated by the author(s).

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PART D: Policy Brief

Inequity in district Primary Healthcare expenditure in South Africa
Is the needs-based approach a solution?
Introduction

Health inequity is prevalent in South Africa in a variety of ways, for example: the distribution of healthcare services as well as per capita (per person) spending on Primary Health Care (PHC). PHC forms the basis of the healthcare system and is a key area of focus in health system strengthening (World Health Organisation 2010). In the South African situation PHC has been getting more attention in recent years with the National Health Insurance (NHI) reforms (Naidoo 2012) as well as the National Department of Health embarking on a PHC re-engineering programme. The PHC re-engineering programme aims to improve the PHC level services in South Africa. There are 3 main streams of this programme namely, multi-disciplinary clinical teams, a school-based healthcare team and community ward-based team.

Undoubtedly, one of the major factors influencing the success of PHC in any country is the financing of this level of care. Naledi et al. (2011) show that there has been an increase (in real terms) in the average per capita spending on PHC in South Africa since 2005, and that the trend can be seen across provinces. While this indicates that PHC is a priority in South Africa, upon closer inspection it can be seen that inequity exists in per capita recurrent public sector PHC expenditure across provinces as well as across districts (Massyn et al.2015).

At present, provincial and district health budgets are allocated on a historical basis, that is, they receive the previous year’s budget with an adjustment for inflation. This entrenches existing inequities and does not take into account changes in health service needs over time (e.g. due to demographic or epidemiological changes).

This study examines the inequity in PHC spending at district level, specifically looking at the North West province as an example and aims at advising the North West Provincial Department of Health on how equity in PHC spending can be improved using a needs-based resource allocation approach for PHC at district level.

Box 1:

What is Needs-based Resource Allocation?

Needs-based resource allocation is the transfer of funds to geographic areas on the basis on their relative need for healthcare, as indicated by proxies of healthcare need. The most frequently used indicators or proxies of need include population size, demographic composition, socio-economic status and an indicator of illness or death in the geographic areas.
This needs-based resource allocation could potentially inform resource allocation decision making in the province. Needs-based resource allocation has been used with great success in many developed and developing countries, in the improvement of equitable spending on healthcare. This is due to the methodology taking into account the relative proportion of need presented by each district using indicators of need and mathematical calculations, resulting in an objective view on the resources required by each district.

**Methods**

**Primary data collection**

23 Mid to senior level stakeholders at provincial and district level were interviewed and asked to express their views on equity and needs-based resource allocation as well as the indicators of need that they would like to see included in the needs-based formula.

**Secondary data collection**

Data was collected on each indicator of need. These indicators were then used to create alternative needs-based formulae. Data was collected on the expenditure of each district on PHC care for 2013/2014. The overall PHC budget from 2009/10 to 2013/14 was examined to calculate the average annual increase in the PHC budget.

**Results**

![Figure 1: The needs-based formulae based on alternative need indicators](image-url)

<table>
<thead>
<tr>
<th>District</th>
<th>2013/2014 District PHC Expenditure</th>
<th>Unweighted Population</th>
<th>Population weighted for age, sex and utilisation</th>
<th>Population weighted for age, sex, utilisation and HIV prevalence (weighted at 20%)</th>
<th>Population weighted for age, sex, utilisation, HIV prevalence (weighted at 20%) and deprivation index (weighted at 20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bojanala</td>
<td>31</td>
<td>43</td>
<td>43</td>
<td>45</td>
<td>44</td>
</tr>
<tr>
<td>NM Molema</td>
<td>29</td>
<td>24</td>
<td>24</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>RS Mompati</td>
<td>21</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>DR K Kaunda</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>21</td>
<td>19</td>
</tr>
</tbody>
</table>
**Stakeholder views**

All stakeholders believed that resources should be allocated equitably across districts and they believed this was not the case currently. Stakeholders also supported the idea of using the needs-based resource allocation approach to address inequity.

**The indicators of need and the formulae**

Figure 1 above, depicts the outcome of the different needs-based formulae based on alternative sets of indicators. This figure also indicates the indicators of healthcare need selected by stakeholders namely; population size, demographic composition, Antenatal HIV prevalence (as an illness indicator) and a deprivation index. The deprivation index takes into account the socio-economic status of each district and combines a variety of indicators, some of which were suggested by stakeholders.

The first bar of Figure 1 shows that inequity in PHC spending across districts does exist in the North West province. The number above each bar indicates the percentage of total PHC expenditure attributable to each district.

Figure 1 depicts that 4 needs-based formulae were created during the study, as indicated in the key. Bar 1 indicates the current expenditure of each district as a percentage of the total PHC expenditure (without any allocation formula applied). Bar 2 reflects the percentage weighted for population size (per capita expenditure). The percentages above bars 2 to 5 are referred to as ‘target allocations’. The target allocation is the percentage of the total budget that each district should be spending in order for resources to be allocated equitably. The objective of needs-based allocation therefore, is to assist the districts to move towards, and achieve, their respective equity target allocations.

By comparing the current expenditure (bar 1) to alternative equity targets (bars 2 to 5), it can be seen that Bojanala and Dr K Kaunda are in need of additional resources (termed relatively under-resourced), and this means that their equity target budget allocation (particularly Bojanala) is higher than their current spending level. In contrast, NM Molema and RS Mompati are relatively over-resourced (i.e. while they may also require additional resources to provide adequate PHC services, they have relatively more PHC resources than the other districts).
How do districts move towards their respective target allocations?

Generally in needs-based studies a maximum amount by which a budget of a district can increase (termed a ceiling) and a maximum amount a budget may decrease (termed a floor) is set. The process followed thereafter is that resources are taken from the relatively over-resource districts and are allocated to the under-resourced districts. This approach of taking from one district to pay another is often not supported by stakeholders as this means absolute reductions in resources for the relatively over-resourced districts.

Therefore it is suggested that a relative redistribution of resources between districts be undertaken in the context of real increases in the overall PHC budget (i.e. where the budget increases above that required to account for inflation). This would allow one to keep the budgets of relatively over-resourced districts constant in real terms (i.e. they would only receive an inflationary increase), while the full amount of the overall budget increase above inflation (the real increase) would be allocated to relatively under-resourced districts.

Research showed that there was a real average annual increase of 8% in the total PHC health budget of the North West province from 2009 to 2014. If this level of real increase in the overall PHC budget could be maintained, and the real budgets of NM Molema and RS Mompati kept constant, and the real budget increase allocated to the relatively under-resourced districts (particularly Bojanala), equity could be reached over an 8 year period. This timeframe was calculated using the equity target allocations produced by the formula that weights the population by demographic composition, HIV prevalence and a deprivation index (i.e. the fourth formula in Figure 1).

What are important issues to consider when allocating funds to districts using the needs-based approach?

The important issues linked to the implementation of the needs-based resource allocation approach are the pace of change and the absorptive capacity of each district. The pace of change entails examining and deciding upon the time-frame in which equity will be reached, as well as the amount that the budgets would increase by each year, while the absorptive capacity deals with the way resources are used by the districts receiving them and the ability to use the resources effectively. This is a key issue in terms of monitoring, as additional resources should not be allocated to districts that cannot use them effectively as these resources could be put to better use elsewhere.
Stakeholder views on the outcomes of the study

Once completed, the study was presented to the stakeholders interviewed as well as additional stakeholders at a provincial health department meeting. The suggested approach of redistributing resources on a relative basis between districts only when there is a real increase in the overall PHC budget, was supported by stakeholders, as this would enable progress to equity without cutting the budgets of relatively over-resourced districts. Stakeholders indicated that this study provided a solid and objective basis for resource allocation decision making in the province, as opposed to the historical methodology currently being used. They believed that this study could not only be used as an advocacy tool in trying to acquire additional resources for PHC and other health services, but also place the spotlight on transparency in resource allocation at district level.

The way forward

The final choice of formula, indicators and their respective weightings as well as the pace of change will be made by the North West Department of Health. Detailed information on the implications of inclusion of alternative indicators of health service need and the weighting of different indicators on each district’s target share, as well as alternative pace of change, has been provided to the health department to facilitate their decision-making.

This study has shown that inequity in district PHC spending does exist and that the current processes of resource allocation are not successful in creating an equitable allocation of resources at district level. The needs-based approach may therefore offer a prospective means of achieving equity in the province.

Policy recommendations

Inequitable PHC spending is seen across districts in other provinces in South Africa. The needs-based resource allocation methodology may therefore be of use to other provinces.

If there is buy-in to use a needs-based resource allocation approach by the North West Provincial Treasury and Department of Health, the North West province could become a pilot project to evaluate the impact of this approach on equity in PHC resource distribution. Should the North West province decide to implement the approach put forward by this study, it may be best to begin with using a simple formula, such as the formula based purely on population size (formula 1) or population size and demographic composition (formula 2) in Figure 1. Other indicators may be added at a later stage and can be used to refine the formula.
over time, particularly once there has been further exploration of the most appropriate indicators of burden of disease and socio-economic status within the South African context. Allocating resources based purely on population size maybe a step in the right direction in terms of attaining equity.

It is important to note that equitable resource allocation should be accompanied by policy measures to remove individual barriers to service use and address gaps in infrastructure and availability of services. These measures may involve sectors other than the health sector.

Box 2:
Tips for successful implementation of the needs-based approach:

- Interview stakeholder to get buy-in on the approach as well as the indicators of need.
- Evaluate the suggested indictors of need to see that they are indeed reflecting the need for healthcare.
- Create various formulae using the suggested indicators of need with appropriate weightings for each indicator.
- Start with a simple formula and build on it as accurate and timely data becomes available (population size is the most vital indicator, followed by demographic composition).
- Where possible always examine the increase in the health budget. Use this funding in the under-resourced areas instead of taking funding from the over-resourced areas. This will also increase stakeholder buy in.
- Understand that when it comes to implementation of the selected formula, implementation over a longer period of time at a slower pace is generally best.
- Ensure that the absorptive capacity of districts is monitored so that funds are used effectively.
- District level management will require guidance from provincial management on how to best utilise the new funds. Communication and transparency are key factors in the implementation process.
References


Ethics Approval letters:
10 December 2014

HREC REF: 830/2014

Prof D McIntyre
Health Economics Unit
Public Health & Family Medicine
Falmouth

Dear Prof McIntyre

PROJECT TITLE: PROMOTING EQUITY IN THE NORTH WEST PROVINCE BY UTILIZING A NEED-BASED RESOURCE ALLOCATION APPROACH (Masters Candidate- Yasteel Maharaj)

Thank you for your letter to the Faculty of Health Sciences Human Research Ethics Committee dated 2 December 2014.

It is a pleasure to inform you that the HREC has formally approved the above-mentioned study.

Approval is granted for one year until the 30th December 2015.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Yasteel Maharaj will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

Signed

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

HREC 830/2014
The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.
POLICY, PLANNING, RESEARCH, MONITORING AND EVALUATION

To : Mr. Y Maharaj
From : Policy, Planning, Research, Monitoring & Evaluation
Subject : Research Approval Letter- Promoting equity in the North West Province by utilizing a needs-based resource allocation approach.

To inform the researcher that permission to undertake the above mentioned study has been granted by the North West Department of Health. The researcher is expected to arrange in advance with the chosen districts or facilities, and issue this letter as prove that permission has been granted by the provincial office.

Upon completion, the department expects to receive a final research report from the researcher.

Kindest regards

Signed

Dr. FRM Reichel
Director: PPRM&E

April 2015

Date

Healthy Living for All