EQUINET

Methods Guide

Regional Network
for Equity in Health
in Southern Africa
(EQUINET)

Guidance on using needs based formulae and gap analysis in the equitable allocation of health care resources in East and Southern Africa

Di McIntyre and Laura Anselmi

Health Economics Unit, School of Public Health and Family Medicine, University of Cape Town

EQUINET Discussion paper 93

With support from TARSC and IDRC Canada

HEALTH ECONOMICS UNIT

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Di McIntyre works in the Health Economics Unit at the University of Cape Town; Laura Anselmi currently works in the Centre for Health Economics, University of Manchester, and provided technical assistance in developing the proposal for the resource allocation formula to the Directorate of Planning and Co-operation, Mozambique Ministry of Health. This manual updates work implemented in 2012. The authors would like to thank all those in the Directorate of Planning and Co-operation, Mozambique Ministry of Health, who contributed in various ways to work that informed this report, Okore Okorafor and Shepherd Shamu for their contributions to earlier phases of this work and IDRC Canada for their financial support.

Executive summary

The equitable allocation of limited public sector health care resources across population groups is a critical mechanism for promoting health system equity and efficiency. The population groups are often defined by geographic areas that correspond to administrative authorities. The use of a needs-based resource allocation formula to calculate target allocations for each province or region and each district is becoming increasingly popular in countries where health care is publicly funded and provided. Target allocations are defined according to the relative need for health services in each geographic area, quantified using indicators such as population size, demographic composition, levels of ill health and socio-economic status.

EQUINET has supported the development of needs-based resource allocation formulae in a number of east and southern African countries in the past. The methods for developing such a formula are summarised in this paper. Our work in the region has persuaded us that it is necessary to supplement the development of a formula with other initiatives to support the successful implementation of the resource allocation processes. We believe that for real progress to be made and to facilitate the gradual shifting of resources, the equity target allocations calculated through the formula must be linked explicitly to national and local planning and budgeting processes.

EQUINET, in collaboration with the Ministry of Health in Mozambique, has been developing such an approach, together with a detailed manual for it (Mozambique MoH and EQUINET, 2012). A broad overview of this approach, which may be of value to other countries, is outlined in this guidance document.

We propose that the needs-based formula be used to identify the provinces and districts that are furthest from their equity targets and that they should receive priority for the allocation of additional budgetary resources.

A detailed 'gap analysis' focuses on comparing the current physical and human resources in each of these provinces and districts to national norms as developed by the ministry of health in a country, with norms based on what is regarded as the ideal or good practice. Where there are no explicit norms, national averages could be used instead.

The gaps in facilities, equipment and human resources are then translated into monetary terms. To fill the human resource and medical supplies gap within existing facilities, a detailed infrastructure development plan and capital budget are prepared, as well as a health service improvement plan and a medium-term recurrent budget. To resource new facilities appropriately, a longer-term recurrent budget is also developed. This process ensures that additional resources are only allocated to a province or district as and when they are able to absorb these resources, whilst maintaining the momentum for reallocation of resources.

By combining equity target allocations from a needs-based formula with a detailed gap analysis that is translated into local plans and budgets (or costed plans), there is a far greater likelihood of successfully implementing a resource reallocation process to achieve equity.

1. Introduction

A key element of promoting Universal Health Coverage and health system equity is ensuring that available resources for health care are allocated equitably across geographic areas (WHO, 2010). The allocation of resources across health care administrations and/or providers that serve different social groups or areas within the same country is crucial in redressing inequities in the purchasing power of those institutions in charge of providing service to different population groups (Kutzin, 2013).

In more centralised systems, ministries of health generally have control over how government funds made available for the health sector (resource pooling) are distributed among provinces or regions and districts to enable health care provision (purchasing) (Kutzin, 2001; McIntyre and Kutzin, 2012). In more decentralised systems, where provinces have varying degrees of control over determining their own health budgets, the provincial office of the ministry of health at least has control over the distribution of resources to districts. Increasingly, with the advent of sector-wide approaches and direct budget support, ministries of health are also able to influence the distribution of external (development aid) funding. Unless explicit attention is given to equitable allocation of resources, most low- and middle-income countries (LMICs) allocate budgets among provinces and districts on a historical basis (Green, 2007). Generally, this means that the budget for each year is simply the previous year's budget with an adjustment for inflation, or an adjustment that reflects the increase in the overall health budget. This entrenches historical inequities in the distribution of health services across geographic areas.

To break this historical inertia, a growing number of countries have introduced needs-based resource allocation formulae to guide the determination of budgets for provinces and districts. The first country to adopt this approach was England, with the goal of achieving "equal opportunity of access to health care for people at equal risk" (Department of Health and Social Security, 1976: 2). The formula in England was originally based on population size, demographic profile (age-sex distribution), burden of disease in different areas, approximated by Standardized Mortality Rate (SMR) and later also socio-economic status (Department of Health, 2011; Smith, 2008). Needs-based resource allocation formulae have been developed to support equity and efficiency, since areas with higher need are also more likely to benefit from receiving additional resources (Rice and Smith, 2002; Whittaker, 2014).

Since the introduction of needs-based resource allocation formula in England, many other countries have followed this lead and developed their own resource allocation formulae. In low-income countries, demographic indicators, burden of disease (measured in various ways) and socio-economic indicators have been included in the formulae. Due to uneven access to services across geographic areas and high unmet need, the inclusion of indicators that could reflect the supply of health care, rather than actual need, has been discouraged, to avoid reinforcing existing inequality (Diderichsen, 2004).

Evidence has shown that the use of resource allocation formulae in low- and middle-income countries appears to have enhanced the equitable allocation across provinces or smaller administrative units. However, no improvements were associated with the partial application of these resource allocation formulae, including in situations where the formula was defined but not applied, where the formula was adopted for allocation across provinces, but not across districts, or

where it was used for allocation of centralised government funding, but not for resources from local governments(Anselmi et al., 2014).

Over the past decade EQUINET has supported a number of east and southern African countries to develop and implement a needs-based resource allocation formula (McIntyre et al., 2001; HEU and CHP, 2003; Namibian MoH and WHO, 2005; Semali and Minja, 2005; Chitah and Masiye, 2007; McIntyre et al., 2007; Chitah, 2010). Our experience with this work shows that development of a needs-based formula and establishment of equitable resource allocation targets are not sufficient in themselves. They need to be supported by additional strategies that facilitate implementation of resource redistribution and that are reflected in national and local plans.

This guidance document provides an overview of how to develop a needs-based formula and how to integrate this with planning and budgeting processes to strengthen implementation of equitable resource allocation. It is based on experience within EQUINET. It is intended to provide policy makers and ministry of health officials with clear guidance on how to initiate and implement equitable resource allocation approaches.

Table 1 provides a glossary of the terms used in the report.

Table 1: Glossary of terms used in report

Absorption capacity	Ability of a health facility, a health district (or in more general terms a unit to which resources are allocated) to use increased financial resources in an effective way (e.g. by attracting additional staff)
Composite index	An index consisting of a number of different indicators combined to make a single index
Deprivation	Disadvantage in terms of social or material conditions usually measured relative to others in society
Medium-Term Expenditure Framework (MTEF)	A three-year budget that allows for planning over a longer time frame than just the upcoming financial year. It presents information for the next financial year as well as projections of available resources and planned expenditure for the following two financial years
Morbidity	Illness, presence of disease or poor health
Needs-based	Based on indicators that reflect need for health care within a particular geographic area
Normalised	Calculating the excess need (how many times more need) each district (or area) has compared to a benchmark such as the best-off district (or area)
Per capita	Per person
Recurrent budget	Budget for expenses that are incurred on an ongoing basis (e.g. for salaries, medical supplies, water and electricity, etc.)
Risk-adjusted	Adjustment for the likelihood or risk of requiring health care
Utilisation rate	Rate at which health services are used (e.g. average number of outpatient visits per person per year or average number of inpatient admissions per 1,000 people)

Source: Authors.

2. Needs-based resource allocation formulae

2.1 Indicators of need most frequently included in formula

The purpose of a needs-based (sometimes called risk-adjusted) resource allocation formula is to ensure that funds from government and potentially also from development aid for health care are allocated across geographic areas based on the relative need for health care in each area. Indicators most widely used to measure relative need for health services in a specific geographic area are:

- population size to capture the size of the population requiring health services;
- demographic composition to capture the differences in need for health care associated with biological age and gender characteristics. This is because young children, the elderly and women of childbearing age tend to have a greater need for health services than other population groups do;
- levels of ill health, with mortality rates usually being used as a proxy for morbidity; and
- socio-economic status, since there is a strong relationship between ill health and low socio-economic status, and because poor people are most reliant on publicly funded services.

Some countries also adjust for the difference in the cost of providing health services in different areas. In certain high-income countries this adjustment relates to urban areas. In England, for example, the higher cost of employing staff in London is taken into account. In some LMICs, a similar adjustment is made for the higher cost of providing care in remote rural areas, related to the payment of additional allowances to health staff to incentivise them to work in rural areas, for example. There is now a substantial literature on the appropriateness and impact of different indicators of need, on which this report draws.

The challenge in the African context has been the lack of data on the different possible components for a resource allocation formula. In particular, there is frequently no accurate data on age-sex utilisation patterns nationally, preventing weighting of the demographic composition. There is also poor death reporting, preventing the use of mortality indicators that rely on vital statistics reporting. Indeed, as illustrated in *Box 1* overleaf, many countries do not adjust for the demographic composition in different geographic areas.

In addition, instead of including overall standardised mortality rates (as was done in England), other mortality indicators such as infant mortality rates (IMR), under-five mortality and/or maternal mortality rate (MMR) are used. These can be accurately determined through household surveys such as the Demographic and Health Surveys or the Multiple Indicators Cluster Surveys. In some instances, this information may be available from the census. In the past, EQUINET has contributed to the development of composite, multi-variable indices of socio-economic deprivation, which can be calculated from most household surveys. Given the strong relationship between low socio-economic status, high morbidity and mortality and the need for health care, indices of socio-economic deprivation can also be in included in resource allocation formulae to weight the population in each geographic area when ill-health indicators are not available.

Box 1: Resource allocation formulae in selected east and southern African countries

Mozambique

Initially, Mozambique used a formula that included service delivery units, number of beds, population, poverty and inverse population density. Since the formula included indicators of health service supply rather than only indicators of need, the Ministry of Health is discussing the proposals for a new formula for the allocation of resources among provinces and districts. The formula under discussion includes: population size, demographic composition, infant mortality and population density (as an indicator of the differential cost of delivering health care in sparsely populated areas).

Namibia

Namibia adopted a formula that incorporated population size, demographic composition and level of deprivation (with the indicators included in the deprivation index being ownership of various assets, access to electricity, source of drinking water, type of toilet facility and type of flooring material in the home).

Tanzania

Tanzania has used a resource allocation formula that includes population size, the under-five mortality rate, extent to which area is rural (assessed by the mileage that health facility vehicles have to travel to provide services) and the poverty level.

Zambia

The resource allocation formula used in Zambia is based on population size, indicators of the burden of disease and level of deprivation. (The indicators included in the deprivation index being ownership of various assets, type of housing material, access to electricity, type of toilet facility, water source, distance to food markets, distance to primary school and distance to public transport, poverty headcount and illiteracy rates.)

Zimbabwe

Zimbabwe developed a formula based on population size, various morbidity and mortality rates (IMR, MMR and tuberculosis incidence rate) and an indicator of socio-economic status (availability of grain per capita).

Source: Semali and Minja (2005); McIntyre et al. (2007): (Mozambique MoH and EQUINET, 2012).

2.2 Calculating the needs-based formula

Irrespective of which indicators of need are incorporated within the resource allocation formula, the basic calculations are similar.

For example, if one is allocating health care resources from a central level across different provinces, the size of the population within each province is the first and most important indicator of need to take into account. If one only uses this indicator, it implies that a province that has 23% of the total population would need 23% of total health care resources. The relative size of the population eligible to benefit from health care is used as the main indicator of the **relative** need for health care in each province. The population size of each province can be weighted for its demographic composition by using **national** age-sex utilisation rates.

To calculate this weighting, the number of people within each age-sex group in that province is multiplied by the **national** average utilisation rate for that group. It is important to note that one does **not** use the *actual* utilisation rates for that province. Utilisation within a particular province is influenced by the availability of health facilities and staff and does not necessarily reflect **need** for health care within that province. For example, a province may have high numbers of young children and old people who tend to require more health care than working-age adults do relative to other provinces. If the province has relatively few facilities and health workers, it may have relatively low utilisation rates. By weighting a province's age-sex disaggregated population by **national** utilisation rates, one can estimate what that province's utilisation rates could, or should be if all people had comparable access to health care irrespective of where they live.

An example of the actual calculation process is provided in *Box 2*.

Box 2: Overview of resource allocation formula calculations

Steps in weighting population for demographic composition

1. Determine age-sex groups appropriate to country context (generally need to at least distinguish between young children, the elderly, women of childbearing age and the rest of the population).
2. Obtain current population size in terms of these age-sex groups for each area.
3. Obtain estimates of the national average utilisation rate of outpatient services for each group (generally this has to be derived from a household survey). If such data are not available for your specific country, you can use information from a comparable country (e.g. within the same region and similar national income level).]
4. Normalise the utilisation rates, i.e. identify the age-sex group that has the lowest utilisation rate and divide the utilisation rate of all other groups by the lowest utilisation rate. For example, in *Table A.1* in *Appendix 1*, females in the 5-14-year age group have the lowest utilisation rate (an average of 1.17 outpatient visits per person per year). Thus, the normalised utilisation rate for females in the 0-4- year age group is 3.63 (4.25 / 1.17) visits per person per year.
5. Calculate the weighted population for each age-sex group by multiplying the population in that group in that area by the normalised utilisation rate for that group. For example, for females aged 0-4 years in Province A, the weighted population is 518,863 (142,840 * 3.63).

Box 2: Overview of resource allocation formula calculations continued

Steps in weighting population for differential mortality

1. Obtain the selected mortality rate (e.g. infant mortality rate, IMR) for each province.
2. Normalise the IMRs, i.e. identify the lowest IMR and divide the IMR of all other provinces by the lowest IMR. For example, in *Table 2*, Province B has the lowest IMR (of 79.2 per 1,000 live births). Thus, the normalised IMR for Province A is 1.11 (88 / 79.2).
3. Multiply the age-sex weighted population by the normalised IMR in each province (e.g. for Province A, the population weighted for both age-sex composition and IMR is 3,083,793 * 1.11 = 3,428,168).

Table 2: Calculations for weighting population for mortality

	Age-sex weighted population	IMR	Normalised IMR	Population weighted age-sex & IMR
Province A	3,083,793	88.0	1.11	3,428,168
Province B	3,782,047	79.2	1.00	3,782,047
Province C	9,615,764	89.2	1.13	10,834,133
Province D	9,266,929	89.7	1.13	10,494,949
Province E	3,888,129	82.5	1.04	4,053,654
Province F	3,064,962	84.3	1.06	3,262,814

Calculating the target allocations

The equity target allocation is then calculated as each province's percentage share of the total weighted population (e.g. for Province A, the percentage share for population weighted by age-sex composition and IMR is 9.56%, which is 3,428,168 divided by the national weighted population of 35,855,766).

Table 3 shows the equity target allocation for each province if a purely population-based formula is used, if the population is weighted for demographic composition and if the population is weighted for demographic composition and infant mortality rate (IMR). The equity target allocations are then compared to the current budget allocation.

Table 3: Current interprovincial distribution of the budget and equity target shares based on three alternative formulae

	Current budget	Population only	Age-sex weighted population	Age-sex & IMR weighted population
Province A	13.91%	9.38%	9.43%	9.56%
Province B	12.86%	11.45%	11.57%	10.55%
Province C	18.96%	29.62%	29.40%	30.22%
Province D	24.61%	28.32%	28.34%	29.27%
Province E	21.46%	12.13%	11.89%	11.31%
Province F	8.20%	9.09%	9.37%	9.10%

The same approach (of normalising the variable of interest and multiplying the weighted population by the normalised variable) can be used if including other variables in the needs-based resource allocation formula, such as differences in socio-economic status and morbidity across provinces. Indeed some provinces may have relatively greater levels of ill health requiring health services (e.g. a higher incidence of malaria, HIV, TB etc.) than other provinces have.

As indicated previously, mortality rates are often used as a proxy indicator of levels of ill health or morbidity. Since mortality may not be a precise proxy of morbidity, it is helpful to include an indicator of differentials in socio-economic status across provinces, given that socio-economic status and ill health are closely related.

The different indicators of need for health care (e.g. mortality and socio-economic status) are weighted. For example, the mortality indicator may be given a weight of 0.1 or 0.2, in order not to skew resource allocation too heavily across geographic areas. If two provinces have the same population size, but Province A has an IMR of 100 per 1,000 live births and Province B has an IMR of 50 per 1,000 live births, would it be appropriate to allocate twice the amount of resources to Province A than to Province B?

While it is important to take into account differences in the burden of illness across geographic areas, mortality indicators cannot be applied mechanistically as it could lead to nonsensical and unrealistic resource allocation patterns. This is why weights of less than 1 are applied to these indicators.

However, there is no golden rule on what these weights should be. Determining the weighting for specific indicators of need is essentially a policy decision that should be given careful consideration in relation to the specific country setting and subject to extensive discussion.

2.3 Managing the development of a needs-based formula

Resource allocation across geographic areas is a political process and can often be controversial. The process must be carefully managed. *Box 3* outlines key management strategies.

As outlined in *Box 3* overleaf, before developing a specific formula it is useful to engage with key stakeholders, particularly senior managers at provincial and district levels. An important first step is to achieve consensus on the principle that resources should be equitably allocated, i.e. that resources should be allocated to geographic areas based on each area's relative need for health services.

The next step is to discuss with these stakeholders the potential indicators of need that could be included in the formula and the relative weights to be given to different indicators. Thereafter, data can be compiled and different versions of a needs-based formula calculated so that their implications can be scrutinised.

Box 3: Summary of key process management strategies for the development and implementation of a resource allocation formula

As efforts to reallocate public sector health care resources are a political process, it is useful to summarise key strategies for successfully managing the process. Based on our experience, we put forward the following tips for managing this process:

- Before embarking on developing a resource allocation formula, discuss the problem of inequities in the distribution of resources among provinces, regions and districts with all key stakeholders. Secure their support for moving towards a more equitable distribution of public sector health care resources, distribution based on the relative need for health services in each geographic area.
- Discuss the full range of possible indicators of need for health services with stakeholders to identify which indicators should be included in the formula within your country. Explore the potential advantages and disadvantages of each indicator and seek stakeholders' views on which indicators are regarded as relevant and important within your country context and the reliability of data for each indicator.
- Also discuss possible weights to assign to each indicator incorporated in the formula.
- Only at this point should data for each indicator be compiled and equity targets based on the agreed formula calculated. It is important to undertake sensitivity analyses (i.e. to calculate the equity targets using a range of different weights for different indicators in the formula) to present the implications of different formulae in a transparent manner. Presenting this information graphically (such as in *Figure 1*) makes it more accessible to a non-technical audience.
- These results should then be presented to key stakeholders as a basis for agreeing on a final formula. It is likely that discussion will be heated at this point, as stakeholders become fully aware of the impact of the formula for their budgets. While compromises will be necessary, it is important to remind stakeholders of their support for promoting an equitable allocation of resources. At a minimum, equity targets should be based on the size of the population in each geographic area.
- At this stage, it is also important to agree on the pace of change. It may be necessary to agree (and remind stakeholders) that no area will receive a real budget cut, but it is important to secure agreement that any increases in the overall budget for health will be directed to provinces, regions and districts that are currently underfunded, with priority going to those areas that are furthest from their equity target.
- It is essential for a commitment at national level to prepare and support provinces or regions and districts to absorb any increases in budget allocations. If resources are not effectively absorbed in the resource reallocation process, there will be mounting resistance to the process.

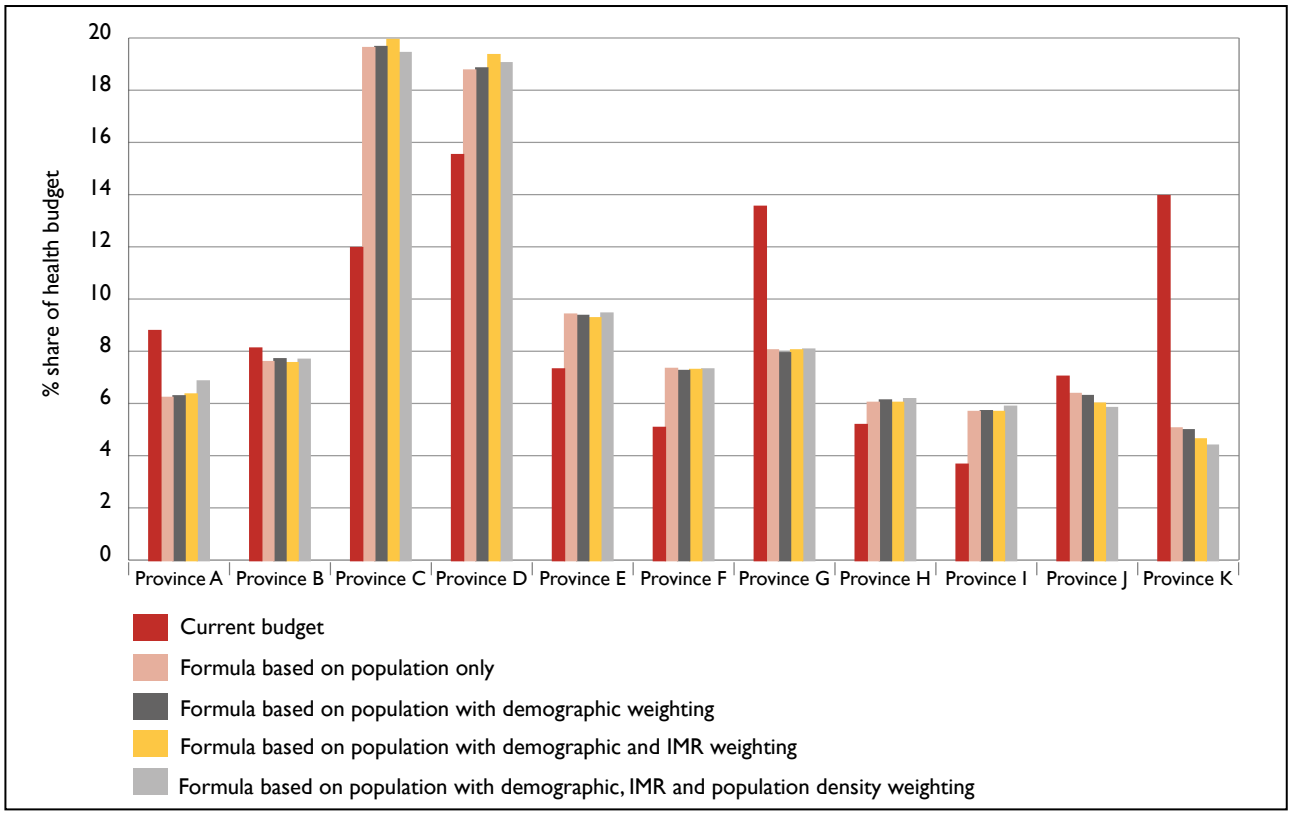
There is likely to be considerable debate among stakeholders as to the most appropriate formula. Sometimes, stakeholders may argue for the inclusion of indicators that would particularly favour their area. There will certainly be efforts by those who stand to lose the most to minimize the impact of a resource allocation formula on their province or district.

This often takes the form of stakeholders challenging the reliability of data for indicators that they would prefer not to be included in the formula. For example, they may argue that IMR estimates are inaccurate.

If this occurs, suggest simply using population size initially, and including other measures of need at a later stage as data quality for these indicators improve. As noted by Cooper (1975): "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". In addition, as *Figure 1* indicates, population size is the most important component of the formula, particularly if relatively low weights are placed on the additional indicators of need.

The equity share target changes only marginally with the addition of more indicators of need. Population size would indicate the direction of changes in resource allocation. It is only when allocations are near the equity target that the inclusion of other indicators of need in the formula becomes important.

Figure 1: Comparison of current budget shares and illustartive target shares derived from alternative formulae for allocating resources across 11 provinces



Revision of resource allocation criteria is more feasible when there is an increase in the overall budget to be re-distributed, as illustrated in the next section. Some stakeholders may object to increasing the budget in some needy areas if these appear to have low absorption capacity, signalled for example by historically low budget execution rates. Documenting the causes of past, low budget execution rates and preparing supportive evidence for actual capacity, for example through a detailed planning and costing of activities to be undertaken, may be a helpful strategy. Not only will it convince dubious stakeholders, but it will also prepare the recipient districts or provinces to absorb additional resources.

2.4 Managing the reallocation process and pace of change

Once the formula has been agreed, the process of resource reallocation and the transition from current budget allocations to the equity target allocations calculated through the formula must be carefully managed. It is not possible for individual provinces or districts to cope with large annual budget increases or decreases. To avoid unmanageable annual budgetary changes, England set a ceiling of 5% real growth in budget over the previous year's allocation and a floor of 2.5% reduction in real budgets (Department of Health and Social Security, 1976; Department of Health, 2011).

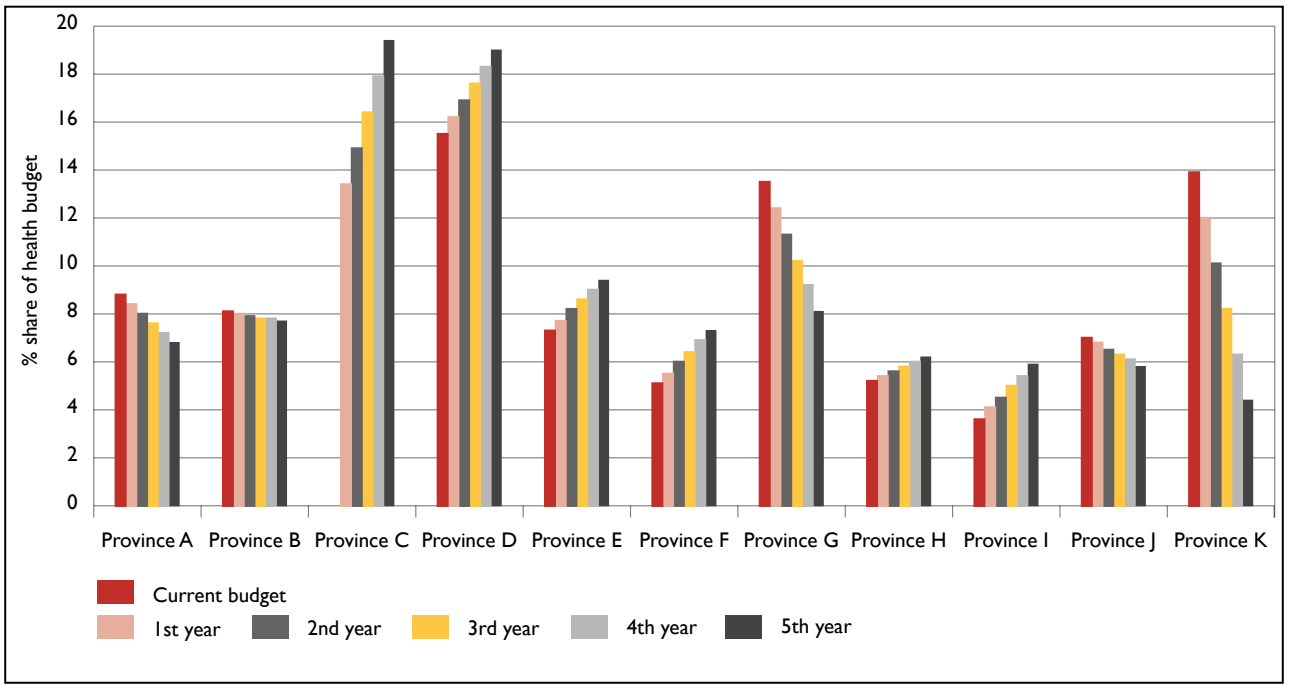
Despite these quite constrained annual changes, England managed to more or less achieve its equity target allocations over a ten-year period. However, the distance between the existing budget allocations and the equity targets was far smaller and the distribution of health care services within the territory was much more even than is the case in most low- and middle-income countries. Equally important was that the overall **real** health budget was increasing over this period, so that the budgets of relatively over-resourced areas did not have to be reduced in absolute terms. Instead, the real budgets of the most advantaged areas were kept constant over this period (i.e. they received their previous year's budget plus an adjustment for inflation). The additional resources made available in the overall health budget were allocated to increase the budgets of relatively under-resourced areas. This strategy mitigated opposition to the needs-based resource allocation process, as better-off areas did not feel that the public sector health authorities were "robbing Peter to pay Paul". Wherever possible, it is best not to reduce the real budget of a district or province. An important reason for this is also that in low- and middle-income countries even the most advantaged areas are underfunded.

In low- and middle-income countries, the magnitude of the necessary changes to reach equity targets is far greater than they were in England. The approach generally adopted in such cases is to phase in the resource reallocation over several years (e.g. over a five- to ten-year, or even longer, period). *Figure 2* indicates what the annual equity targets would be if the resource redistribution process were to be implemented over a five-year period in an illustrative country.

Figure 2 overleaf indicates that the annual budgets of some provinces, particularly Province C and Province K, would need to change quite dramatically if resources were redistributed over a five-year period and that a ten-year (or even longer) phasing-in period is likely to be much more feasible.

A key factor that will influence the pace at which resources can be redistributed is whether the overall budget for health care is increasing. If it is, budget cuts may not need to be imposed on areas such as provinces G and K. As indicated above, if the overall budget is increasing, the budgets of provinces that are relatively over-resourced could be held constant rather than being cut in absolute terms, with all of the funds arising from the increase in the overall budget being directed to relatively under-resourced provinces. If there is no increase in the overall health budget, any increase in the budget of relatively under-resourced provinces would have to be funded by absolute budget cuts in relatively over-resourced provinces.

Figure 2: Illustrative changes in budget shares with interprovincial resource distribution phased over five years



Another factor that will influence the pace of change is the ability of health services to absorb budgetary changes. Inequities in budgetary allocations reflect inequities in the distribution of health facilities and human resources. Thus, even if the recurrent budgets of relatively under-resourced provinces and districts were increased, they may not be able to absorb these resources as it takes time to recruit new staff or build new facilities. As previously indicated, and further discussed in the next section, advance planning and costing of activities may turn out to be crucial to support the envisaged pace of change.

EQUINET's experience of working with countries in the region to adopt equitable resource allocation processes has highlighted a need to move beyond simply developing a formula. Sometimes the magnitude of resource redistribution required to achieve equitable allocations appears overwhelming. Although policy makers have adopted a needs-based formula, implementation in the form of actual resource redistribution never really occurs.

We believe that for progress to be made, the equity target allocations must be linked explicitly to planning and budgeting processes to facilitate the gradual shifting of resources and guarantee that those are absorbed and used efficiently. EQUINET has been developing such an approach in collaboration with the Ministry of Health in Mozambique (Mozambique MoH and EQUINET, 2012) and the next section illustrates this approach.

3. Linking resource allocation targets to planning and budgeting

The key issue in making the link to planning and budgeting is not to use the equity targets produced by the needs-based formula in a mechanistic way. Provincial and district budgets should not simply be calculated based on the needs-based formula. Instead, the budget finally allocated should be based on carefully developed plans that demonstrate how resources would be used.

The equity targets are best used as an indicator of which provinces or districts are under-resourced. These areas should receive priority for the allocation of additional budgetary resources, with particular emphasis on those areas whose current budgets are furthest from their equity targets, based on realistic plans for absorbing resources (e.g. their ability to attract and retain additional staff and the identification of service delivery inputs funded through recurrent expenditure currently underfunded). The gap in human resources is often a good proxy of the gap in other inputs such as equipment, consumables and drugs.

It is necessary to get a good sense of what resources each of these provinces and districts can absorb within the next year (or next few years when a Medium-Term Expenditure Framework [MTEF] budget is used).

A gap analysis can be undertaken to determine which provinces and districts are the most under-resourced in terms of physical inputs, rather than simply from a financial perspective. Such an analysis involves comparing current physical and human resources in these areas to national norms.

Some health ministries have developed norms of what they regard as the ideal (e.g. facility-to-population ratios, staffing profile and equipment lists for each type of facility). Frequently, these norms are based on current resourcing in facilities that are regarded as good practice and by consulting experts (e.g. in directorates of human resources and infrastructure). If norms have not been established, national averages (e.g. of staff profiles in specific types of facilities) could be used.

3.1 Key data for the gap analysis

The initial gap analysis may require the collection of a considerable amount of primary data if such data are not compiled through health information systems. Nevertheless, it is worth investing in compiling this data as they will provide the basis for a clear plan for how to use additional resources in currently under-resourced areas and, when costed, a well-justified budget.

Once the initial data have been collected, regular updating is less resource intensive, particularly if the health information systems are adjusted to include these indicators in future. In countries where the health information system provides reliable routine data on the availability of health staff and key equipment, the latter can be used and have the advantage of enabling the gap analysis calculations to be updated annually.

The focus of the needs-based resource allocation formula is on the distribution of **recurrent** budgets, and so this is a key focus of the gap analysis. In many instances, however, a province's or district's ability to absorb increases in recurrent budgets is dependent on **capital** spending, particularly if the area has insufficient health facilities. We recommend that data be compiled on:

- The number of each type of health care facility (primary care facilities and hospitals) within each district and province. As each type of health facility has a standard number of hospital beds, the number of each type of facility also reflects the number of beds. This is then compared to national norms, which are frequently expressed in terms of facility-to-population ratios (such as those presented in *Table 4*), to identify whether new facilities are needed. Once again, these norms should not be mechanistically applied. For example, in a sparsely populated area, more primary care facilities may be needed than the population norm suggests to ensure reasonable physical access. Requirements for new buildings must be supplemented with an assessment of the current state of existing facilities to identify facilities that require renovation or major maintenance repairs. This component of the gap analysis can then be used to develop a medium-term infrastructure development plan and capital budget.

Table 4: Example of facility norms for Mozambique

Facility type	Catchment population
Rural health centre I	7,500 – 20,000
Rural health centre II	16,000 – 35,000
Urban health centre C	10,000 – 25,000
Urban health centre B	18,000 – 48,000
Urban health centre A	40,000 – 100,000
District hospital	50,000 – 250,000
Rural hospital	150,000 – 900,000
Provincial hospital	800,000 – 2,000,000

Source: Mozambique Ministry of Health (2002).

- The number and condition of key items of equipment within existing facilities relative to national guidelines on equipment requirements in different categories of health facility (see *Table 5*). Depending on the cost of specific items of equipment, the need to purchase new equipment may inform the recurrent budget (for low-cost items) or the capital budget (for high-cost items).
- The number of each category of health personnel in each facility relative to national guidelines on staffing levels for different types of facilities (see *Table 5*) and for community-based services. This will generally constitute the largest component of additional recurrent budget requirements and will be likely correlated to the remaining components. For later years, it will be important to estimate the human resource requirements for the new facilities that have been built, so that as a capital project is completed, an adequate recurrent budget is available to make the facility immediately functional. This will also require careful co-ordination between different directorates within a ministry (e.g. the finance section which undertakes the budget and the infrastructural development and human resources sections).

Once the gap in facilities, equipment and staff has been calculated, it can be translated into monetary terms using the cost of building each type of facility, cost of each item of equipment and the salaries of different categories of health personnel (see *Table 5*). Measuring the gap in monetary terms allows one to quantify the minimum increase needed in the budget to fill the gap. Once the size of the gap has been identified, it can be compared across provinces or districts, noting that it may be constituted by different items.

Table 5: Example of simplified equipment and staffing norms for facilities, Mozambique

Item	Health centre I	Health centre II	District hospital	Rural hospital	Unit cost (MZM)
Beds	6	64	130	130	20,000
Electric fridges	1	3	6	6	14,000
Electric sterilisation system	1	2	4	4	40,000
Measurement devices:					
Scales for infants	2	4	8	8	4,500
Scales for adults	2	4	8	8	8,000
Sphygmomanometer	2	3	20	20	2,000
Auricular stethoscope	2	4	20	20	2,100
Pinard stethoscope	1	3	6	6	1,100
Clinical thermometers	4	15	25	25	120
Laboratory equipment:					
Microscope	0	1	1	1	45,000
ELISA test device	0	1	1	1	25,000
Haematology device	0	1	1	1	845,000
Biochemistry device	0	1	1	1	784,000
CD4 cell count device	0	1	1	1	28,000
Other equipment:					
Vacuum	2	4	7	7	26,000
Resuscitator	2	6	10	10	7,500
Oxygen kit	0	3	5	5	7,000
X-ray	1	1	1	1	1,750,000
ECG	1	1	1	1	19,000
Human resources:					
Doctor	0	1	7	7	217,035
Nurse	0	0	1	1	180,752
MCH nurse	0	0	1	1	180,752
General medicine technician	1	1	3	3	72,384
Preventive medicine technician	0	1	1	1	72,384
Laboratory technician	0	1	2	2	72,384
Radiology technician	0	1	2	2	72,384
Pharmacy technician	0	1	2	2	72,384

Source: Adapted from Mozambique Ministry of Health (2002).

Table 6 provides a simplified illustration of such a gap analysis, drawing together gap estimates from individual facilities in each sub-district.

Table 6: Simplified gap analysis for a district

	Sub-district A		Sub-district B		Sub-district C		Sub-district D		Total gap	Monetary value of gap (MZM
	Existing	Gap	Existing	Gap	Existing	Gap	Existing	Gap		
Gaps related to existing facilities										
Beds	0	36	0	4	0	4	0	4	48	960,000
Electric fridges	0	3	0	1	0	1	0	1	6	84,000
Electric sterilisation system	0	2	0	1	0	1	0	1	5	200,000
Measurement devices:										
Scales for infants	2	2	1	1	1	1	1	1	5	22,500
Scales for adults	2	2	1	1	1	1	1	1	5	40,000
Sphygmomanometer	4	0	0	2	0	2	1	1	5	10,000
Auricular stethoscope	4	0	0	2	2	0	1	1	3	6,300
Pinard stethoscope	4	0	0	1	1	0	1	0	1	1,100
Clinical thermometers	10	5	0	4	1	3	0	4	16	1,920
Laboratory equipment:										
Microscope	1	0	0	0	1	0	0	0	0	0
ELISA test device	0	1	0	0	0	0	0	0	1	25,000
Haematology device	0	1	0	0	0	0	0	0	1	845,000
Biochemistry device	0	1	0	0	0	0	0	0	1	784,000
CD4 cell count device	0	0	0	0	0	0	0	0	0	0
Other equipment:										
Vacuum	2	2	1	1	1	1	1	1	5	130,000
Resuscitator	0	6	0	2	0	2	0	2	12	90,000
Oxygen kit	2	1	0	1	1	0	1	0	2	14,000
X-ray	0	1	0	0	0	0	0	0	1	1,750,000
ECG	0	1	0	0	0	0	0	0	1	19,000
Human resources in existing facilities:										
Doctor	1	0	0	0	0	0	0	0	0	0
Nurse	0	0	0	0	0	0	0	0	0	0
MCH nurse	0	0	0	0	0	0	0	0	0	0
General medicine technician	1	0	0	1	1	0	0	0	2	144,768
Preventive medicine technician	0	1	0	0	0	0	0	0	1	72,384
Laboratory technician	0	1	0	0	0	0	0	0	1	72,384
Radiology technician	0	1	0	0	0	0	0	0	1	72,384
Pharmacy technician	0	1	0	0	0	0	0	0	1	72,384

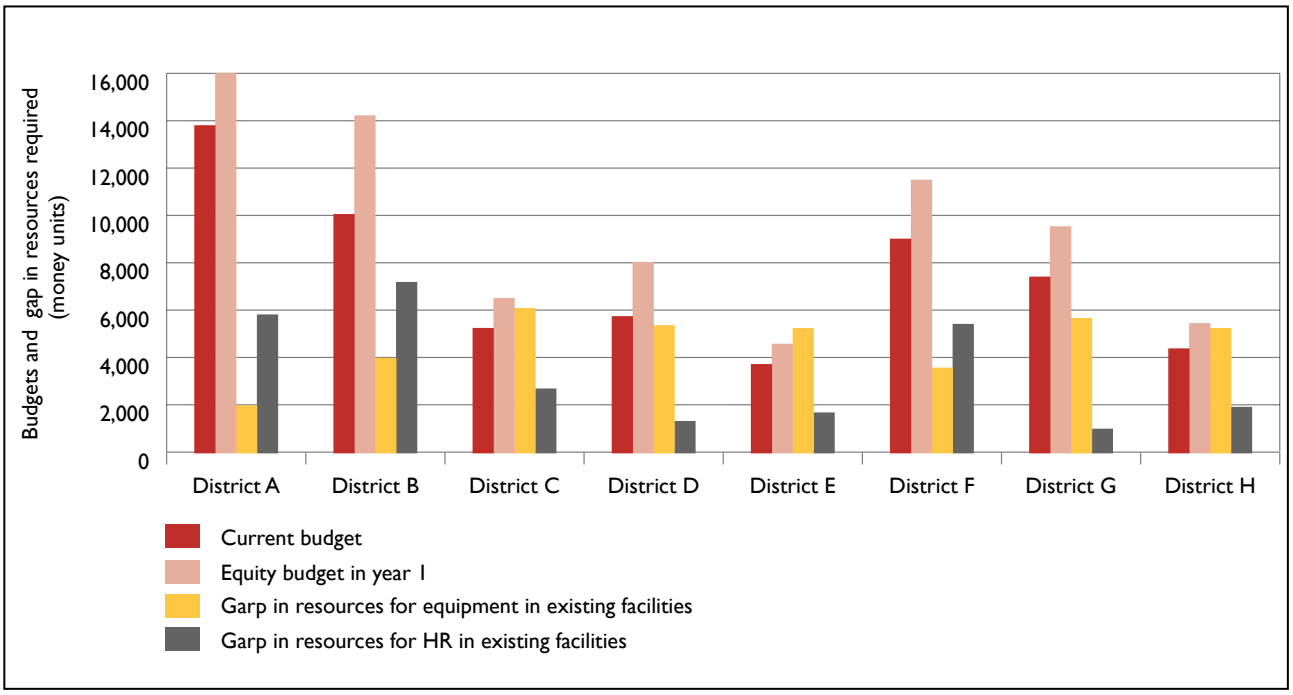
Table 6: Simplified gap analysis for a district continued

	Sub-district A		Sub-district B		Sub-district C		Sub-district D		Total gap	Monetary value of gap (MZM
	Existing	Gap	Existing	Gap	Existing	Gap	Existing	Gap		
Gaps related to new facilities										
Building of new health facilities										
Build health centre II	0	0	0	0	0	0	0	1	1	36,000,000
Build district hospital	0	0	0	0	0	1	0	0	1	90,000,000
Human resources for new health facilities										
New health centre II	0	0	0	0	0	0	0	1	1	1,572,545
New district hospital	0	0	0	0	0	1	0	0	1	6,092,047

3.2 Linking the resource allocation formula targets and the gap analysis

Figure 3 shows the relationship between the resource allocation formula targets and the gap analysis for districts in a currently under-resourced province. The first column indicates the current budget for each district while the second indicates the suggested budget based on phasing in the equity targets over five years. The third and fourth columns are based on elements of the gap analysis. They indicate that all districts can absorb the increase in budgets as proposed by applying the resource allocation formula by addressing deficiencies in equipment and human resources within existing facilities. In many districts, the required resources highlighted in the gap analysis exceed the increase in budgets in the first year of phasing in the resource allocation formula. In this case the gaps will only be filled over several years of budget increases.

Figure 3: Comparison of current budget, target budget and gaps in resources required for equipment and HR in existing facilities across districts



While the gap analysis indicates that increased funding through the equitable resource allocation process can be absorbed at district level, additional actions are required to ensure that resources are indeed absorbed effectively. The results of the gap analysis should first be structured into detailed plans and budgets along the following lines:

- Capital plans and budgets for building new facilities, making major repairs and renovations to existing facilities and purchasing high-cost equipment (both to close equipment gaps in existing facilities and to fully equip new facilities once construction is completed) – although it may take considerable time to close the facility gaps.
- Short-term increases in recurrent budgets, including increased staffing of existing health facilities to move towards national staffing guidelines, the purchase of low-cost equipment required to fully equip existing facilities and minor maintenance of existing facilities. The need for additional drug supplies should also be taken into account, although these are often centrally procured (i.e. additional budgets need to be provided at the national level for increased drug supplies).
- Medium-term increases in recurrent budgets for staff and medical supplies for newly constructed facilities.

When making adjustments for additional recurrent expenditures, take into account additional drugs and other medical supplies that will be needed as utilisation inevitably increases with the greater staffing levels, not only salaries for staff. Planning for increasing drugs availability and strengthening the logistic of distribution are crucial and need to be aligned with planning for increasing recurrent expenditure in the identified disadvantaged areas. Modalities for this alignment are country specific since they have to be adapted to the organisation of the purchasing and distribution system.

The gap analysis and associated development of detailed plans and budgets for expanding service capacity in currently underserved districts will promote greater capacity for absorbing resources allocated in line with the targets suggested by the resource allocation formula. However, these plans still need to be implemented successfully. The effective use of additional resources allocated to underserved areas is critical to ensure that the resource reallocation process is sustained. In settings where gaps are mostly concentrated in the availability of equipment and consumables in existing health facilities, these plans may be confined to the redistribution of financial resources. However, where gaps derive from the absence of health facilities in underserved areas, reallocating financial resources per se will never be sufficient to allow approximating the targets set by resource allocation formulae. Building new health facilities is a necessary pre-condition to the reallocation of financial resources. Efforts to redistribute resources across geographic areas to promote equity are easily discredited if districts allocated additional funding are unable to use these resources effectively. Thus, implementation support should also be provided to districts and there should be careful monitoring and evaluation of the implementation process.

Finally, a critical element of the planning and budgeting process is taking into account whether there are overall human resource shortages within the country. If there is a shortage, it will inevitably make it more difficult for relatively under-resourced areas to recruit additional staff even if their budget is increased, hence reducing their capacity to absorb funds. While beyond the scope of this particular report, it is critical that the above planning and capital and recurrent budgeting process is closely linked to a human resource development plan.

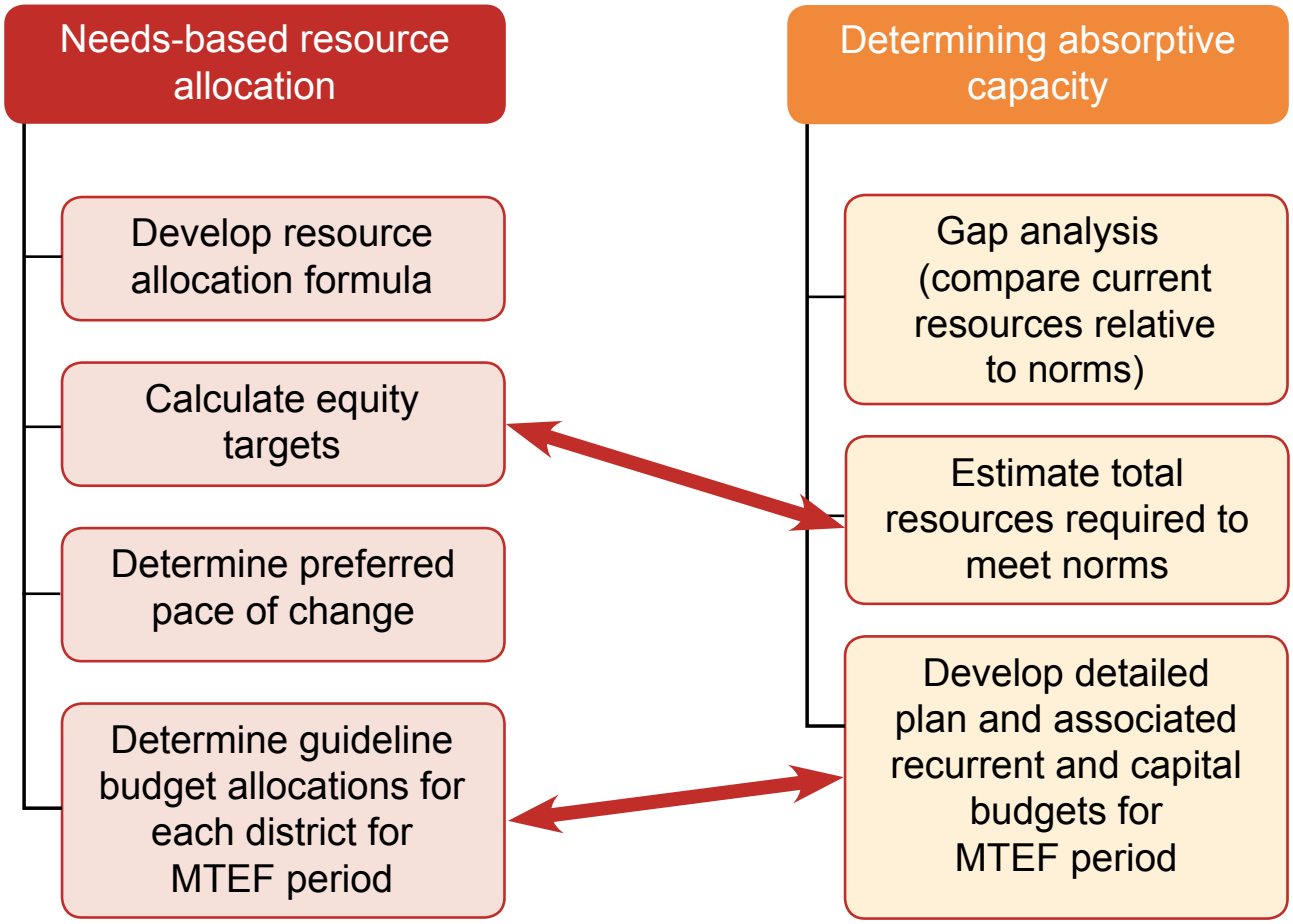
4. Summary of overall process

This paper has outlined two processes that are important in promoting equity in the allocation of resources among geographic areas while simultaneously promoting the efficient use of resources. *Figure 4* provides an overview of these two processes and attempts to highlight the interrelationship between them.

On the one hand, there should be a process for establishing equity targets or an equitable share of the health care budget for each geographic area (in this figure, focussing on districts). It is critical that this process is led by national government, which will have to provide stewardship in mediating the competing demands of different districts and must ensure that the principle of equity guides this process.

On the other hand, each district should assess its existing services, and the physical and human resources it has, relative to national norms. This gap analysis will allow each district to estimate the total resources each district requires to meet the national norms.

Figure 4: Summary of overall process and interrelationships



There needs to be a comparison of the equity targets/equitable shares of the overall budget with the total resource requirements of each district. In effect, this compares the relative equitable budget share of each district with its **absolute** resource requirements in order to reach the national norms.

This comparison is necessary because the overall health system may be under-resourced, i.e. the combined total resource requirements for all districts may exceed the total budget available for funding district services. If this is the case, the pace of change should not be too ambitious as many districts will be under-resourced. However, if some districts are already resourced at or above the national norms, it is possible to give a clear priority to the most under-resourced districts and to focus considerable energy on improving their resourcing.

The equity targets and preferred pace of change (see *Figures 1* and *2*) can then be used to determine a **guideline** budget allocation for each district for each year of the MTEF period. This gives the district an indication of the magnitude of budget changes they can expect, providing a basis for realistic planning and budgeting (i.e. to avoid unrealistic expectations).

However, the **final** budget allocation to each district can only be determined once the gap analysis has been translated into detailed plans and recurrent and capital budgets for the MTEF period and after careful consideration of what budget increase is **feasible** for each district to absorb (as explained in section 3.2).

For example, in the first year, it is only possible to increase recurrent spending on services provided at **existing** facilities by purchasing new equipment, improving the availability of medical supplies and employing additional staff (but there will need to be special efforts to ensure that staff can be attracted to currently under-resourced districts as these are likely to be in areas that are relatively unattractive to health professionals).

It will also be important to initiate capital spending to expand existing or build new facilities in underserved areas as soon as possible. However, there may also be delays in implementing capital projects due to the need for transparent tendering processes etc. It is advisable to err on the side of caution in the first year and, based on implementation experience in that year, to gradually adjust the MTEF allocations for future years. This requires careful monitoring of the implementation process.

It cannot be stressed enough that the role of the national Ministry of Health should not be restricted to simply calculating equity targets and finalising MTEF budget allocations. Officials at the national and provincial or regional levels must support district managers to absorb increased budget allocations (e.g. to fast-track tendering for capital projects and procuring equipment; to facilitate attracting health professionals to underserved areas by offering rural allowances and other incentives).

5. Conclusions

This paper provides an overview of the methods used to promote an equitable distribution of health care resources across geographic areas. It highlights that a needs-based resource allocation formula is extremely valuable in breaking the inertia of historical incremental budgeting that is so frequently used to determine allocations across areas.

It also highlights that all too frequently developing and trying to move towards equity targets generated by a needs-based resource allocation formula are not sufficient, particularly because geographic areas face challenges in absorbing additional funds allocated to them. Successful implementation of resource redistribution can be greatly facilitated by undertaking a detailed gap analysis. The gap analysis will provide a basis for developing detailed infrastructure and service development plans accompanied by capital and recurrent budgets.

There is also a need to strengthen local capacity for planning, budgeting and implementing plans to ensure effective use of limited health care resources and phasing of implementation. Detailed monitoring and evaluation of all these processes will enable learning that can enhance effective redistribution of resources to promote health service equity across geographic areas.

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Appendix 1: Table A.1: Calculations for weighting population for demographic composition

Population 2012											
	Female					Male					Total population
	0 - 4	5 -14	15 - 44	45 - 59	60+	0 - 4	5 -14	15 - 44	45 - 59	60+	
Province A	142,840	200,862	322,071	52,340	30,967	142,332	198,750	296,060	55,717	30,448	1,472,387
Province B	155,670	240,365	397,814	79,631	54,006	156,083	236,312	355,691	76,939	44,824	1,797,335
Province C	400 156	630,681	1,045,797	180,307	96,777	400,799	627,718	947,773	206,246	111,587	4,647,841
Province D	415,775	632,775	986,841	170,329	92,879	417,150	630,916	836,258	170,871	90,410	4,444,204
Province E	165,500	280,167	420,482	69,969	42,476	163,973	277,837	378,572	67,231	37,521	1,903,728
Province F	119,118	210,135	320,205	75,064	63,584	118,674	205,686	227,416	45,656	41,146	1,426,684

	Female					Male				
	0 - 4	5 -14	15 - 44	45 - 59	60+	0 - 4	5 -14	15 - 44	45 - 59	60+
National utilisation rates	4.25	1.17	2.98	2.50	5.10	4.36	1.23	1.20	2.60	5.00
Normalised rates	3.63	1.00	2.55	2.14	4.36	3.73	1.05	1.03	2.22	4.27

Population weighted by age gender utilisation 2012											
	Women					Men					Weighted total population
	0 - 4	5 -14	15 - 44	45 - 59	60+	0 - 4	5 -14	15 - 44	45 - 59	60+	
Province A	518,863	200,862	820,318	111,838	134,984	530,400	208,942	303,651	123,816	130,120	3,083,793
Province B	565,468	240,365	1,013,236	170,152	235,411	581,643	248,431	364,811	170,976	191,556	3,782,047
Province C	1,453,558	630,681	2,663,654	385,271	421,848	1,493,576	659,909	97,075	458,324	476,868	9,615,764
Province D	1,510,294	632,775	2,513,492	363,951	404,857	1,554,508	663,271	857,701	379,713	386,368	9,266,929
Province E	601,175	280,167	1,070,971	149,506	185,152	611,045	292,085	388,279	149,402	160,346	3,888,129
Province F	432,694	210,135	815,565	160,393	277,161	442,238	216,234	233,247	101,458	175,838	3,064,962

Equity in health *implies addressing differences in health status that are unnecessary, avoidable and unfair. In southern Africa, these typically relate to disparities across racial groups, rural/urban status, socio-economic status, gender, age and geographical region. EQUINET is primarily concerned with equity motivated interventions that seek to allocate resources preferentially to those with the worst health status (vertical equity). EQUINET seeks to understand and influence the redistribution of social and economic resources for equity-oriented interventions. EQUINET also seeks to understand and inform the power and ability people (and social groups) have to make choices over health inputs and their capacity to use these choices towards improving their health.*

EQUINET implements work in a number of areas identified as central to health equity in the region:

- Protecting health in economic and trade policy
- Building universal, primary, health-care oriented health systems
- Equitably strengthening health systems and responses to HIV and AIDS
- Fair financing of health systems
- Valuing and retaining health workers
- Organising participatory, people-centred health systems
- Social empowerment and action for health
- Monitoring progress through country and regional equity watches.

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