Literature Review on Needs Based Resource Allocation

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Training and Research Support Centre
With
Ministry of Health and Child Care

With the Regional Network for Equity
In health in East and Southern Africa (EQUINET)

December 2013

REBUILDING THE FOUNDATIONS FOR UNIVERSAL HEALTH COVERAGE WITH EQUITY IN ZIMBABWE

With support from
Rebuild programme: LSTM

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Cite as: Shamu, S, TARSC (2013) Literature Review on Needs based Resource Allocation TARSC, MoHCC Harare

Acknowledgements to Dr Rene Loewenson and Dr Sue Laver, Training and Research Support Centre (TARSC) for peer review and technical edit; to Dr Gibson Mhlanga, Mr Leonard Mabhandi and Mr Gwati Gwati from the Ministry of Health and Child Care (MoHCC) for support and official documents provided; to Laura Anselmi, London School of Hygiene and Tropical Medicine for external peer review and to the Rebuild Consortium, Liverpool School of Tropical Medicine (LSTM) for funding support.

Executive Summary

The ReBUILD Programme in Zimbabwe seeks to take forward a programme of work within the context of the work in Zimbabwe on health financing policy and on Universal Health Coverage (UHC). One element of this work is to identify options for integrating measures of risk or health need and gap analysis on delivery of the Essential Health Benefit in the allocation of pooled central funds to districts and purchasers. This report provides a background review of literature that informs the protocol for the field work that will be carried out to develop a resource allocation formula for distributing public health resources.

While the above countries have resolved to address the issue of inequity in resource allocation through tailor made prospective allocation models, in most low and middle income countries and particularly in Zimbabwe, an appropriate set of criteria and formula to guide resource allocation still need to be developed and implemented.

Resource allocation for health is a topical issue in many low and middle countries given the varied forms of health systems and various burdens and forms of disease. Resources are limited in all countries and with varied and complex health problems demanding attention. It is not a new topic, a vast literature on resource allocation has been gathered and assessed before; hence this review only provides a bibliography of literature on resource allocation.

In this literature review analysis we defined resource allocation as the distribution of resources, particularly finance from the central level to the peripheral levels. Resource allocation referred to the distribution of resources among competing groups of people, organisations, ministries and programmes.

Currently, Zimbabwe is not using any specific resource allocation model to allocate resources to the MoHCC from the treasury, although government has expressed its desire for Universal Health Coverage. The main objective of this review is to provide various versions of traditional and current models for resource allocation in health and assess their feasibility and applicability to the Zimbabwean setting.

Literature on resource allocation was searched in archives of published literature on resource allocation from diverse internet databases and web engines, including Hinari, google, google scholar, World Health Organisation, EQUINET and other relevant scholarly websites. Grey literature from libraries and other websites were also searched.

The literature provided examples of factors associated with need and deprivation that have been identified and used in health sector resource allocation in other countries. While some countries have chosen to use only demographic indicators for the needs based resource allocation formula, others have chosen to use a combination of demographic, behavioural and morbidity and mortality indicators.

The review highlighted that there is no universally accepted method for resource allocation, but that countries can adopt resource allocation methods that other countries are using depending on the data availability and quality. The level of sophistication in some of the resource allocation methods, especially those used in Europe reflects a situation of availability and accessibility of as well as institutionalisation of the resource allocation mechanism over some time. For new countries embarking on a resource allocation mechanism, stakeholders may want to review

what is feasible and apply a mechanism that is most possible to apply and addresses policy principles.

In the case of Zimbabwe, it would be useful to at least suggest for policymakers a number of resource allocation models and indicators rather than focus on only one model, so that the policy makers can choose what model to eventually adopt. Updated population based indicators are very common in Zimbabwe since a number of national surveys (population census, income and expenditure survey, poverty survey) have been carried out since 2010. Experiences from the developed and developing countries has shown that it takes a lot of time to come up with an acceptable method for allocating resources; hence starting with a less ambitious method is more ideal, and once the method has been accepted and institutionalised, move gradually to include other indicators.

1. Background

The ReBUILD Programme in Zimbabwe seeks to take forward a programme of work within the context of the work in Zimbabwe on health financing policy and on Universal Health Coverage (UHC). The MoHCW, TARSC and national and international partners are implementing research to support policy dialogue and decisions on the technical design around elements of equitable health financing. Noting the context and need to move from short term measures to the 'Rebuild' of the domestic health system in a manner that links to and lays a foundation for the longer term framework for UHC; and the National Health Strategy and stakeholder priorities raised for this; and taking into account the work on the Essential Health Benefit (EHB) underway; one element of this work is to identify options for integrating measures of risk or health need and gap analysis on delivery of the EHB in the allocation of pooled central funds to districts and purchasers. This report provides a background review of literature that informs the protocol for the field work.

Resource allocation for health is a topical issue in many low and middle countries, given the varied forms of health systems and various burdens and forms of disease. Resources are limited in all countries and with varied and complex health problems demanding attention, there will always be an opportunity cost in expenditure decisions.

2. Introduction to resource allocation

According to Green (1992) resource allocation refers to the distribution of resources, particularly finance from the central level to the peripheral levels. Resource allocation refers to the distribution of resources among competing groups of people, organisations, ministries and programmes. When resources are scarce and demand outstrips supply, the resources allocation becomes very important. According to Tauber (2002), resource allocation is both an economic and moral challenge (distributive justice). How resources are defined has implications for how economic players behave. If resources are defined as a social good, then issues of justice and equity become relevant, as do the principles of welfare economics. If resources are viewed as commodities, then resource allocation assumes a different dimension and issues of competition and maximisation of benefits become paramount. According to Gugushvilli (2007), resource allocation is a complex exercise. Solving this complexity has involved theoretical studies on three dimensions of resource allocation; that is cost effectiveness analysis of treatments, use of quality adjusted life years and needs based resource allocation. The latter focuses on health needs as influencing resource allocation.

Resource allocation is one of the stages of planning. Resource allocation and budgeting are two sides of the same coin (Green 1992). While resource allocation is generally associated with the broad allocation of aggregate financial resources, budgeting refers specifically to the detailed plan of how funds are to be used.

Resource allocation can take place at different levels: At national level between ministries, at ministry level between provinces or districts or programmes, within facilities such as hospitals between activities or patients. Rising costs and competing needs have raised the need for a resource allocation approach that is more responsive to health needs and capacity to absorb and effectively use funds. Resource allocation also involves different levels of decision making: At a macro level it involves decision making by government policy makers and at a micro level it may involve decision making by hospital administrators. In order to address the issue of limited resources some of the attempted solutions have involved increasing technical or allocative efficiency in the use of limited resources; and addressing equitable allocation in the distribution of scarce resources.

Maximization of health outcomes calls for mechanisms for resource distribution that fairly address all the population and regions' health needs. According to McIntyre and Anselmi (2012), the most common indicators of need are;

- population size
- demographic composition
- levels of ill health; and
- socio-economic status

Costing of health benefits is one the most important components of resource allocation. The Essential Health Benefit provides information on basic norms in terms of what is supposed to found at the different levels of care in terms of facilities, personnel, types and levels of care and services, what is supposed to be funded for an analysis of the gap between norms and practice, and the likely costs of activities to ensure delivery on the norm.

Resource allocation calls for a thorough and full assessment of all the opportunity costs of any distributional decision to be taken. The resource allocation paradigm recognizes that it is not how much the country has that matters most, but how it spends those resources that it has in order to maximize the heath status and welfare of its citizens (Asante et al, 2006). In South Africa, for example, poor health status of black people is attributed partly the racial inequities in resource allocation associated with apartheid (McIntyre 2000). According to Asante et al (2006), policy makers have advocated for the abandonment of historical funding models, that allocate resources on the basis of past allocations and the ability to raise demand for resources, to new mechanisms that address inequities through the recognition of different geographical and population characteristics. Historical funding models are often perceived as arbitrary and risk exacerbating of the existing inequities and inefficiencies.

This has been an issue internationally. According to Gugushvilli (2007), the United Kingdom National Health Service (NHS) has since 1977 pioneered needs based resource allocation. The current technical approach and focus on resource allocation in UK owes much to the work of the original Resource Allocation Working Party (RAWP) (Asthana et al 2004). It was initially applied by geographic-planners, and then used for allocations to health authorities and to primary health care trusts. The RAWP allocates resources according to size of the problem, which often encompasses health need (Mooney and Houston 2004). The RAWP emphasized equity, with a geographical distribution of resources to ensure equity and equal access to health care for people at equal risk (Asthana et al 2004). Earnshaw and Dennert (2003) have raised that mathematical programming offered the most viable and efficient method for allocating resources in the health sector when there are budgetary limitations and constraints. Mathematical programming refers to models that are able to hold simultaneous consideration of multiple constraints with built in sensitive analysis (Earnshaw and Dennett 2003). It has been used mainly in the economic evaluation of health care technologies.

A number of countries in Europe (Germany, Switzerland, UK, Sweden, Spain) have also adopted scientifically based allocation models that factor in simple age-weighting (Bennet, Kelly and Silvers, 2004). Spain adopted a simple non-weighted capitation method of budgeting, while Sweden and United Kingdom, have adopted more sophisticated capitation methods that factor in socio-economic indicators, mortality data and morbidity data (Smith et al 2001). These allocation methods are based on need and hence respond to the needs of the population at any given time (See *Table 7, 8 and 9* for other country examples).

In the Southern African region, Namibia has developed a resource allocation model based on the population size, demographic composition and level of deprivation (cite reference). South Africa allocates resources to its provinces using indicators of health need, education and other service indicators (McIntyre et al 2007), while in Zambia the method of resource allocation used recognizes population size in each geographic area, the burden of disease and the level of deprivation (McIntyre et al 2007). (See *Table 7, 8 and 9*) for other country examples).

While the above countries have resolved to address the issue of inequity in resource allocation through tailor made prospective allocation models, in most low and middle income countries, including Zimbabwe, an appropriate set of criteria and formula to guide resource allocation still need to be developed and implemented.

3. Aims and methods for the review

The main objective of this review is to document the traditional and current models for resource allocation in health as applied in different settings. Specifically the paper presents a review of literature to inform the resource allocation work in Zimbabwe on:

1. needs based resource allocation indicators and models.
2. the resource allocation models used in different settings, and
3. the population indices used in different models.

The searches included ublished literature from internet databases and web engines, including Hinari, Google, google scholar, World Health Organisation, EQUINET and other relevant scholarly websites.. Grey literature from libraries and other websites were also reviewed. Key terms used with the Boolean Operators (OR, AND and NOT or AND NOT) in the literature search included; resource allocation; needs based; deprivation; health index; budgeting; planning; per capita allocation. Our review used a simple snowballing technique using references from papers sourced for gathering further literature on resource allocation REWORD not clear. After review of abstracts we obtained a total of 34 papers, cited in reference section below.

4. Zimbabwe's Health Sector and budgeting

This section outlines Zimbabwe's health sector and how resources are allocated in the health sector.

Table 1 below shows the different types of health facility levels and ownership in Zimbabwe. Most facilities are owned by the Central Government and the Local Government (urban and rural district councils), with the remaining facilities owned by the mission and private sector.

Table 1: Health Facilities in Zimbabwe by ownership and level of care

Level of Care	Central Government	Mission	Rural District Councils	Private	Total
Primary: Clinics/RHCs	301	55	525	109	990
Rural hospital	55	61			116
Secondary (District)	50	8	0	0	58
Tertiary (Provincial)	8	0	0	2	10
Quaternary*(Central Specialist)	7	0	0	12	19
Total	421	124	525	221	1193

Source: MOCHC 2013 * Includes the two psychiatric hospitals – Ingutsheni and Ngomahuru

The government also recognizes the role and existence of traditional medicine and a Traditional Medical Practitioners' Council receives an annual government allocation.

The Rural Health Centres (RHCs) and Urban Clinics are the first point of contact between the community and the health sector. They provide the essential primary level care. According to the Ministry of Health and Child Care (MoHCC), the RHCs should provide services for a population of 10 000 people, living within a radius of not more than 8 kilometres (MoHCW 2009). RHCs are also funded by rural district councils, although their health workers are paid for from the Central Government budget. **Urban clinics** are mostly financed from the Local government funds, user fees and a small grant from the Central Government to cater for 50% of their recurrent expenditure (TARSC/MoHCW 2002).

The next level of care consists of district hospitals. There are 58 district hospitals, fifty of which are owned by the government and the remaining eight are designated district hospitals owned by the Zimbabwe Association of Church Hospitals (ZACH). The district hospitals are the first referral points of care and cater for a catchment population of approximately 140 000 people.

The church related hospitals also receive an allocation from the Central Government through an annual transfer of funds to ZACH for running the secretariat and another allocation to district designated mission hospitals. ZACH was founded in 1974 and supports provision of health care to more than 126 hospitals and clinics country wide. These institutions are mostly in the rural areas and cater for the most vulnerable population groups. ZACH contributes 38% of the total of 18200 beds in the country, and about 68% of the rural hospital beds. This gives it a considerable role in the provision of health care in Zimbabwe. The ZACH secretariat gets 80% of their support from external funders, of which 60% of that goes towards programmes and the remainder for administration. The remaining 20% of the ZACH funding comes from government and other sources. The next level of care consists of 8 provincial hospitals which act as the next referral point from the district. The final level of care consists of 7 teaching and specialist hospitals, which are found in Harare and Bulawayo with the exception of Ngomahuru psychiatry hospital which is found in Masvingo Province.

4.1 Budgeting and budget allocations

Although the government of Zimbabwe has expressed its desire for Universal Health Coverage through endorsement of the Abuja declaration (MoHCW 2009), there is no evidence of the same commitment in the Ministry of Finance actual budget allocations to health.

Zimbabwe's health care budget system has not changed significantly since 1980 . Budgets are focused on functional expenditure categories (medical, preventive, administration and research) rather than programmes, and the budget allocation by geographic area has remained unclear. The budget system reflects a traditional provider/purchaser nexus, although the relative share in contribution to health production and expenditure has significantly changed. Parirenyatwa Hospital as the largest teaching and referral hospital has always attracted the largest share of the national budget resources, followed by the remaining central, tertiary and provincial hospitals (See Table 2). The budget allocations to provincial hospitals do not systematically take into account their different population sizes; needs or disease burdens in a defined formula for resource allocation.

Table 2: Budget allocation to Provinces, 2012 and 2013

Hospital	2012 (US$m)	2013 (US$m)	Population 2012
Parirenyatwa	19.5	18.9	
Chitungwiza	1.0	1.7	2 098 199
Harare Hospital	1.1	1.9	
Mpilo	1.2	1.9	
United Bulawayo Hospital	1.1	1.9	
Ingustheni	1.0	1.0	655 675
*Manicaland	1.0	1.8	1 755 000
*Mashonaland Central	1.0	1.6	1 139 940
*Mashonaland West	1.0	1.5	1 449 938
Chinhoyi	1.0	1.0	
*Midlands	1.0	1.7	1 622 476
*Masvingo	1.1	1.4	1 486 604
*Matebeleland North	1.0	1.4	743 871
*Matebeland South	1.0	1.4	685 046
*Mashonald East	1.0	1.6	1 337 059

*Provincial Hospitals
Source: Ministry of Finance Budget Estimates 2009-2013; Zimstat 2012

A supply side budget allocation that was aimed at providing resources to underserved rural areas and to districts worked reasonably well in the early years after independence (TARSC, MoHCW 2002) . The approach however perpetuated the pre-independence status quo favouring curative over preventive services as shown in *Table 3*.

Table 3: Composition of MoHCC Budget allocations 2002-2013

Allocation Head	2002	2003	2005	2006	2008	2009	2011	2012	2013
Administration	4.8%	6.7%	6.8%	8.3%	9.1%	13.9%	14.0%	14.8%	8.0%
Medical Care	78.0%	81.3%	80.5%	81.7%	80.6%	79.9%	74.0%	73.9%	83.0%
Preventive Services	16.0%	10.9%	11.3%	6.7%	9.6%	6.0%	10.0%	8.9%	7.0%
Research	1.2%	1.1%	1.4%	3.3%	0.8%	0.2%	2.0%	2.4%	2.0%

Source; Ministry of Finance Budget estimates 2002-2013; * Estimates

It also favoured the provinces that absorbed more resources (TARSC/MoHCW 2002). For example, provinces that were under spent were penalised by being given less money than those that overspent. In terms of institutional arrangements this budgetary approach also tended to accord the MoHCC all the fiduciary management powers, as it operated a highly centralised system of managing resources.

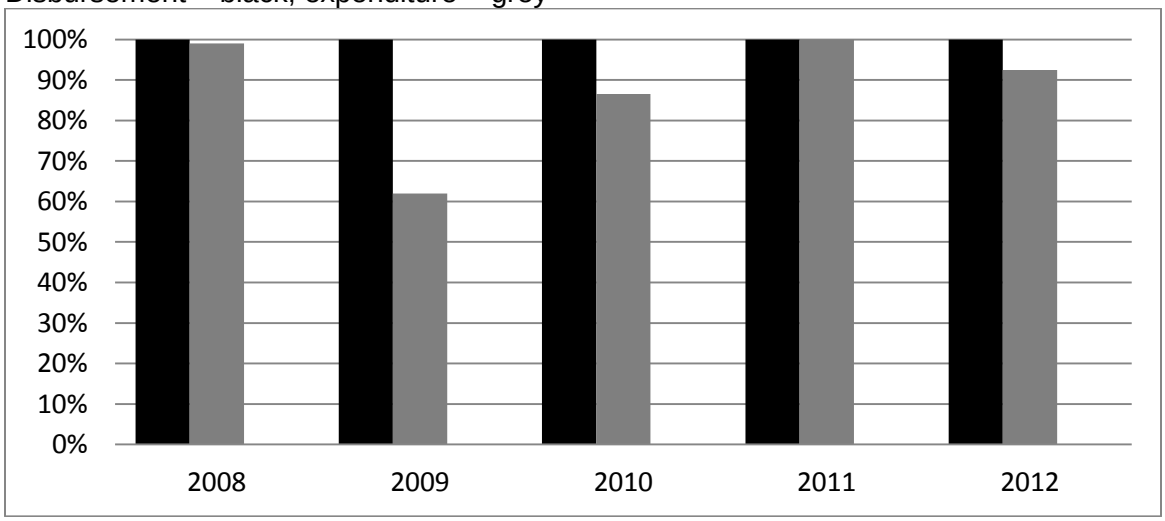
Budget allocation to the MoHCC by the Central government has largely remained below the Abuja Target of 15%. It is envisaged that when the existing fiscal space improves as industrial capacity utilization increases and lines of credit are opened, new resources will be realized that could then be redistributed to priority areas. Nevertheless, actual expenditure still remains starkly lower post 2009 than the allocated funds, as the cash budgeting system the country adopted in 2009 meant that funds could only be allocated if they were made available in revenue to the fiscus (MoHCC 2013) (See Figure 1). Cash budgeting was adopted as a result of low levels of revenues and a generally constrained fiscal space.

Four instruments of fiscal space could be used:

- Domestic revenue mobilization through improved tax administration or tax policy reforms;
- Reprioritization and raising efficiency of expenditures;
- Official Development Assistance (ODA) through aid and debt relief; and
- Deficit financing through domestic and external borrowing;

Of these, only the first two options are currently available to Zimbabwe. The other two are not currently feasible given the moratorium on debt relief or debt financing by IMF and the World Bank.

Figure 1: Expenditure as a percent of allocated disbursements 2008-2012:
Disbursement = black, expenditure = grey



Source: MoHCC 2013

In 2011 the World Bank through its Results Based Financing programme gave the MoF US$15 million to support the maternal and child healthcare in 18 districts of Zimbabwe. In July 2013 the World Bank increased its support to the health sector by providing US$20 million to support the RBF programme's maternal and child health services. Through this added support, it has increased its coverage to include two new urban districts of Harare and Bulawayo. In 2013 China offered Zimbabwe a loan in the form of hospital equipment, recorded in the Central Government accounts as direct budget support. Most other external funds are not currently pooled in the treasury under Central Government and are extra budget funds and purpose specific. The biggest external fund contribution is currently the Health Transition Fund (HTF) which targets the provision of maternal and child health. Funds from the HTF do not go through the Ministry of Finance; are not reported in the national budget, and are jointly administered by HTF funders and the MoHCC.

4.2 Health Expenditure patterns

In principle, the public health sector in Zimbabwe should be financed by central and local government, as has been the situation since 1980. However, over the past decade the shares of expenditure have shifted over the years to reflect a greater contribution from households and external funders. As shown in the *Table 4* below, the general government's share of expenditure since the year 2000 has gone down from 53% to 18% in 2010. Household expenditure and external assistance have gone up from 36% and 1.3% in 2000 to 39% and 19% in 2010 respectively (See Table 4).

Table 4: Health Expenditure in Zimbabwe 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2010
Total expenditure on health (THE) as % of GDP	10.0	8.1	8.1	7.6	8.4	8.9	9.3	8.9	2.1
External resources on health as % of THE	1.3	4.2	2.0	4.8	11.6	20.8	17.3	0.2	19.0
General government expenditure on health (GGHE) as % of THE	53.0	38.4	35.8	30.7	40.9	45.4	48.7	46.3	18.0
Private insurance as % of health expenditure	34.3	28.8	29.2	29.3	29.0	28.9	28.8	28.8	21.0
Out of pocket expenditure as % of Health expenditure	-	36.0	-	-	-	-	-	-	39.0
Out of pocket expenditure as % of PvtHE	45.5	50.3	50.9	51.1	50.7	50.5	50.3	50.4	62.5
*General Government Per Capita Health Expenditure	13.55	7.90	7.15	5.29	8.09	9.46	10.37	9.11	8.2

Source World Health Organisation 2010; MoHCC 2013; and Author's own calculations; estimates on General Government Per capita Expenditure on Health show an incrrease to US$18 but this still falls far short of the Minimum WHO target of US$34.

5. Resource allocation in Zimbabwe

Zimbabwe has in prior years applied resource allocation formulae, but not systematically over time. For example in the early 1980s, the country used an innovative approach to the allocation of resources between different levels, using a facility based approach and applying the overall workloads (TARSC, MoHCW 2002)

This method was abandoned after the introduction of Economic Structural adjustment programme in 1991 in favour of using a mathematical formula for the allocation of resources between provinces, termed a workload based allocation method (TARSC MoHCW 2002). However, the formula was found to be too complex. A Review Commission on the health sector in 1999 recommended improvements to the formula and place more emphasis on population, reciprocal of population density, level of poverty and number of referrals (MoHCC 1999).

The challenges that were associated with the incremental budgetary system forced the government to experiment with a new budgetary system known as the *workload based resource allocation mechanism* that spanned from1992-2000 (TARSC, MoHCC 2002). In 1996 district hospitals and rural health facilities were authorised to collect and retain about 40% of user fees collected at their facilities to cater for some of their needs. Noting that some districts inherently could not collect and retain meaningful revenues, the Ministry of finance has been allocating an 'equalisation grant' to district meant to compensate for those districts that are not able to collect enough revenues. The ministry of health used a computerised workload based allocation system that manipulated data generated from the health information system, using a number of indexed indicators such as population, number of health centres, number of government hospitals, gender, bed type (general and maternity), bed numbers, bed occupancy, staff salaries and allowances and number of vehicles. The allocation used a predetermined split between the provinces and the central hospitals of 65% and 35% respectively, based on workload as measured by the number of inpatients and outpatients (TARSC, MoHCC 2002). However, this budgetary system perpetuated a hospital based approach, at cross purposes with the ministry's equity agenda.

In 2001 the MoHCC and its partners commissioned a research project to look into ways in which resources in the health sector could be allocated. This 'Equity Gauge' Project, developed a formula for the allocation of resources that integrated health need, as discussed in more detail below (TARSC, MoHCC 2002). The 2002 Equity gauge project recommended a needs based resources allocation formula be used for allocating resources in Zimbabwe's health sector (TARSC, MoHCW 2002). The formula included indicators of; population, infant mortality rate, maternal mortality rate, under 1 year immunization rate, the TB incidence rate and grain availability per capita as proxies for health need and poverty. The method was not followed through as the overall budget to the health sector fell markedly and in the face of a hyperinflationary environment. While the government provided a resource allocation formula to provincial health offices for equitable distribution of the health budget, a study found little knowledge of the formulas (Osaka et al 2010). Government corroborated this information in its National Health Strategy 2009-2013 noting that: "*There is some doubt however as to whether there has been a consistent and persistent use of the different formulas, and where this has happened, final allocations have still needed to be moderated"* (Government of Zimbabwe 2010 in Osaka et al 2010:p45).

The onset/ advent of economic problems in 2000 necessitated the abandonment of the workload based resource allocation method in favour of the *demand based allocation* from 2001 – 2008 (TARSC, MoHCC 2002). This bottom-up method of resource allocation was based primarily on the budget bids submitted by provinces, districts, central hospitals and other units to the MoHCC. It assumed that provinces and the hospitals were able to come up with more realistic budget estimates. A demand based allocation method does not necessarily relate to the peculiar needs of each province or district. It is mainly based on the submission of bids forwarded to the treasury by districts through their provincial offices and Ministry of Health Headquarters from guess-estimated values. This means that the outcome may not be needs based and may not be equitable. It may favour districts that are already well resourced due to their capacity to exercise demand and lead to further disadvantage in less well resourced and capacitated districts, despite population need.

This system also never really took off, since it was overtaken by inflation. The mammoth task of matching the annual provincial budget bids with allocations in a highly fluid and hyper-inflationary environment became unrealistic. It led widely different bids from provinces and budget demands above the resources available to MoHCC. The allocation system was challenged by the fact that MoHCC did not receive its allocation from MoF and no provinces got the amounts they requested.

This led the MoHCC to adopt yet another budgetary approach, a modification of the demand based resource allocation. The control of the Ministry of Finance and the MoHCC increased in resource allocation. The MoHCC held control of almost all major components of expenditure, except peripheral expenditure such as travel and subsistence or stationary. Although budget proposals started at the base, the relative allocative shares were still decided using a top-down approach. This budgetary system perpetuates the already visible historical imbalances in the allocation of resources and favours established facilities as well as curative over preventive services, as noted earlier. In a purely demand based allocation framework those who have established and better services, better developed infrastructure and personnel demand more and actually use more resources. For example, the areas that do have laboratory personnel will naturally get more laboratory resources than those which do not have. The availability of health personnel is also likely to have an impact on the levels of resources to be allocated to particular areas, on the capacity to absorb and use resources and on the levels of efficiency. By 2013, the budgeting in Zimbabwe uses a bottom up approach where health facilities come up with their

budget plans based on their annual activity or work plans. Rural Health Centres send their budgets to the district Medical officers where they are consolidated and sent to the Provincial medical Directors who further consolidate then and send them to the MoHCC head office. The MoHCC then forwards the consolidated budget bids to the ministry of Finance who then decide on the allocation based on the following criteria;

- key health issues
- priority health issues
- MoHCC cost justifications, and
- availability of resources (Osaka et al 2010)

This demand based resources allocation framework also assumes that districts and provinces have feasible annual operational plans to base their budgets on. A National Integrated Health Facility Assessment (NIHFA) survey in 2012 found, however that only 65% of facilities in the country reported having an annual workplan in place (MoHCW 2012). In a purely demand driven framework the provinces that already have more will perpetually attract more resources at the expense of the marginalised provinces who obviously do not necessarily have the basis to ask for more. The historical focus on curative care has shifted the budget away from the primary health care approach and has resulted in disproportionately higher shares of expenditure for central and tertiary hospitals at the expense of the community and primary levels, even while the MoHCC has always maintained that about 40% of the curative budget allocation goes towards preventive programmes (MoHCC 2012). This has made it difficult to address capacity gaps that have left some areas of the country's provinces under-resourced and worse off than others as reflected in the 2005/06 and 2010/11 Demographic and Health Survey (DHS) health outcomes (Zimstat and ICF Macro 2011).

6. International resource allocation models

The literature provides examples of factors associated with need and deprivation that have been identified and used in health sector resource allocation elsewhere. While some countries have chosen to use only demographic indicators for the needs based resource allocation formula, other have chosen to use a combination of demographic, behavioural and morbidity and mortality indicators. *Table 5* lists some of the common indicators of need and deprivation used.

Table 5: Factors associated with need and deprivation in health financing

Demographics	**Behavioural characteristics**	**Morbidity and mortality**	**Other**
• Age • Sex/Gender • Education • Birth rate • Employment • Socio-economic status • household income and expenditure • Ethnicity • Genetics • Geographical location • Population size • Population density	• smoking • physical activity • Nutrition and health • religion • culture and tradition • family beliefs	• premature mortality rate • life expectancy • infant mortality • birth weight • mental health • chronic conditions • cancer • diabetes • Hypertension • Sexually Transmitted diseases • HIV and AIDS	• self related health • disability • environment • housing • sanitation • marital status • policy • infrastructure and transport • Urbanisation • Food and agriculture

Source: Adopted from McIntyre et al 2000

Using a relevant mix of these indicators can assist in identifying the communities with most health need. Most of these indicators are routinely available by age, sex and geographic origin and are also population based. They correlate with household socio-economic status and are also relatively independent of the supply of services. It is, however, unlikely that a single indicator can used as a measure to determine the need for health services. Instead a composite indicator that combines data from multiple sources would be more appropriate as shown in *Table 6* below. Most of the indicators are of disadvantage or inequality.

Table 6: Common Indicators used in a population level deprivation and health index

Name of Index	**Mortality indicators**	**Morbidity Indicators/disability**	**Other indicators**	**Weighting**
Plymouth Health District Index	Standardized mortality ratios; Infant mortality	Proportion of residents in private households classed as permanently sick or disabled		Indicators were normalised, added together and then re-normalised, as with Townsend
G index	Crude disease specific mortality for reference and target populations	Disease specific mortality(hospital days, clinic visits)		Mortality data were given more weight in the equation
K Index	Unnecessary mortality caused by specific conditions	Unnecessary disability caused by specific conditions		
Gross National Health Product	Total Number of deaths from all causes by age	Total number of disability days from both acute and chronic conditions by age	Life expectancy by age	
H Index	Monthly distribution of mortality for a given year	Frequency of illness, duration of illness (indirectly measured by number of doctors' calls, clinic visits and number of complaint periods) Incidence rates, prevalence rates	Duration of stay (how long in each year a person remains health) Duration of stay (how long in each year a person remains health)	Weighted average used to calculate an age-adjusted index of health States of health are weighted on the basis of severity Weights attached to the expected duration are derived from the instantaneous incidence rates that define transition probabilities
Indian Health Status Index	Age specific mortality	Number of days of disease specific hospitalisation		Weighted by linear measurements of perceived need
Index of multiple Deprivation	Comparative mortality ratios for men and women at ages under 65 years	People receiving attendance allowance or disability living allowances as a proportion of people of working age receiving incapacity benefit or severe disablement allowance; age and sex standardized ratio of limiting long-term illness; proportion of births of low birth weight (<2500g)	Income; employment; education skills and training; housing and geographic access to services	'Shrinkage' procedure applied to all data, factor analysis to generate weights to combine indicators, index is ranked then domain standardized and transformed to an exponential distribution; individual domains are weighted (health is 15%) and combined to produce ward index score.

Name of Index	Mortality indicators	Morbidity Indicators/disability	Other indicators	Weighting
Health status measure	Infant mortality rate; male mortality rate from cardiovascular diseases in the 30-59 Yrs age group; female mortality rate from cardiovascular diseases in the 30-59 yrs age group; male mortality rate from stomach cancer in the 30-59 yrs age group; female mortality rate from stomach cancer in the 60 years age group; male mortality rate from cancer of trachea, bronchus or lungs in the 30-59 years age group; premature mortality (30-64 years) from all diseases	Percentage of births with low births weight	Index also included industrial emissions of equitoxic dust and gases; aggregated, averaged annual concentrations of basic air pollutants and quantity of used mineral fertlisers and limestone; for rural areas: environment-hostile industrial plants, and for urban areas discharge of untreated sewage to surface waters were used along with other three above.	Normalisation and aggregation with the use of a taxonometric method
Health Status index		Female hospital admissions for injuries; male hospital admissions for injuries; admissions to hospitals of children aged 0-4 years for respirator infection; admissions to hospitals of persons aged more than 65 years for respiratory infection	Fertility	A single prototype index measure of the five indicators was constructed; data was aggregated to the level of the municipality; each indicator was normalized by subtracting the provincial average from the observed score for each municipality and dividing the result by the variable's standard deviation; the five normalized indicators were summed and divided by the square root of five.
Cumulative disease index	Neo-natal, infant and childhood (1-6 years)	Three level Cumulative Disease index, cumulative incidence of asthma, diabetes, epilepsy and intellectual disabilities; number of hospital days.	Perinatal health (no problems, minor or major problems) including birth weight, gestational length, Apgar score and perinatal diagnosis; special education, postponed school entry, attendance in a special class because of disease or disability; disease related benefits.	
Q Index	Age and sex adjusted mortality for both populations, crude mortality rate	Hospital days for target population, outpatient visits	Years of life lost because of premature death for target population	More weight is given to more severe diseases

Name of Index	Mortality indicators	Morbidity Indicators/disability	Other indicators	Weighting
General Index of Health	Mortality by external causes, mortality in 15 -64 years old	Incidence of low birth weight (<2500g)		Each of the three components given equal weighting
LEFAM	Avoidable deaths from tuberculosis (5-64 yrs), cancer of the cervix (15-64 yrs), cancer of the uterus (15-64yrs), hodgkin's disease (5-64 years), rheumatic chronic diseases (5-44 yrs), respiratory infections (1-14 yrs), asthma (5-44 yrs), hernia (5—64 yrs), appendicitis (5-64 yrs), hypertensive disease (5-64 yrs), cerebrovascular disease (35-64 yrs), anaemia by deficiencies (0-64 yrs) and pregnancy, child birth and puerperium (0-64 yrs); total deaths according age			Subtraction of number of avoidable deaths from total deaths according to the age to determine life expectancy free from avoidable mortality
Expectation of life Free of disability/ expectation of Disability		Disability and bed disability	Life free of disability and life expectation	Life table values are weighed according to disability time experienced at each level.
Overall Health index	Premature mortality (standardized mortality ratios for persons <65 years based on deaths over 3 years	Permanent sickness and disablement (% residents who classed themselves as permanently sick or disabled)	Low birth weight and delayed development (% live births <2800g based on births < 3 yrs)	All three indicators given equal weighting and combined using Z-scores technique
Health Expectancy	Mortality	Morbidity and disability data		
Jarman Index			Lone pensioners; number of people < 5 yrs; persons in single parent households; % in unskilled jobs; % people unemployed; household overcrowding; number of migrants; ethnicity	Carried out a survey on general practitioners' work; Weighted using census factors based on the degree on which they increased their workload or pressure on their service. Index used angular or arcsine transformation and a standadisation.
Townsend index of deprivation			% economically active that are unemployed; % households with >1 person per room; % households with no car; % households not owner occupied	unweighted

Name of Index	Mortality indicators	Morbidity Indicators/disability	Other indicators	Weighting
Carstairs deprivation index			Unemployment; overcrowding; percentage of households with no car; low social class	Unweighted **Variables calculated on the basis of an individual and not household
Material Deprivation (MATDEP)			% households with >1 person per room; % households lacking or sharing bath/ shower; % households with no central heating; % households with no car	
Social Deprivation (SOCDEP)		Percentage of households containing a person with limiting long-term illness; percentage of households containing dependants only (single pensioners with long term illness)	% economically active population unemployed; % economically active 16-24 years unemployed; single parent households as % all households; % households containing a single pensioner	Unweighted
Italian Cadum national population Index			Low education; unemployment; renter occupier housing; no indoor bathroom; lone parent with child	unweighted
Arbuthnott index	Mortality rate among children under 6 years of age		Unemployment; % elderly people claiming income support; households with 2 or more indicators of deprivation (unemployed; permanently sick head of household; low socio-economic head of household; overcrowding; large households; lone parent and all elderly household)	

Source: Kaltenthaler et al 2004; McIntyre et al 2000; Testi et al 2011

Given that these indices may be complex to apply, a simple method that allocates resources on a purely per capita basis is an option that can be adopted by poorer countries, where the quality of data and resources to collect data on particular indicators may be a challenge. Mortality indicators are also more appropriate where data on morbidity or occurrence of different disease conditions may be difficult and expensive to get or even difficult to incorporate in a resource allocation formula (Doherty and Van Der Heaver 1997). Indices such as the deprivation index and the asset index give some prominence to weighting of factors, although that may be prone to manipulation, especially by decision makers.

Table 7 gives a summary of resource allocation models used in select Southern African countries and *Table 8* resource allocation models used in high and middle income countries, with advantages and disadvantages of the indicators used in the model. In South Africa, the use of a formula was found to lead to geographic reallocation and reallocation across care levels (Briscombe et al 2010)

Table 7 and 8 (overleaf): Resource allocation approaches

Country	Decentralization and equity strategies	Level of resource allocation	Formula details	Variables	Advantages and/or disadvantages of variables	PRSP and SWAp mechanisms	Data collection/ Surveillance methods
Namibia	Poverty reduction strategy Resources redistribution	Regional	asset indices weighting primary indicator-population size cost differential	whether household has electricity, TV, radio etc source of drinking water main type of toilet facility	lack of access to electricity can create health related environmental health hazard		Principal component analysis (PCA)
Zambia	Health sector decentralization, delegation, and decon-centration targeting Weighting population and rural-urban factors to attain equality in distribution	District	Material deprivation index	Maternal Mortality Rate % U5 population Poverty headcount Proportion of houses of poor material Population density	Strong indicator, reflecting access to and availability of quality health care Powerful indicator for health problems Proxy for transport needs and hence costs	Sector Program Assistance involves disbursement of generalized resources following the implementation of policy or administrative reforms that are considered to be key constraints to sector progress.	Data chiefly obtained from Census and Living Conditions Monitoring Survey.
South Africa	Seeks vertical equity and reduction of health inequalities using Deprivation Index with varying weights	Provincial Block grants	Depriva-tion Index with varying weights	Population proportions of females, U5, >25 yes, no schooling, unemployed, no piped water, no access to any form of refuse disposal, standards of living Death attributable to infectious diseases Over-crowding	Children and young adolescents - vulnerable groups Lack of formal education affects the ability to earn income and make health related decisions Female literacy is considerably lower than male literacy. very high. Not appropriate cause of the poor quality of death registration	Small area analysis	Principal component analysis

Source: Briscombe, Sharma and Saunders 2010

Geographically based resource allocation schemes, as shown in Table 8 below allocate resources by geographic areas. They are somewhat bit different from nationally focused resource allocation. However, they are not completely different conceptually and also use needs based resource allocation indicators as discussed above *(population, deprivation and health needs indicators),* although the models are data demanding and more complex.

Table 8: Resource allocation approaches in high and middle income countries

Country	Scheme	Plans	Individual Level indicators	Plan Level indicators	Other Factors
Australia	New South Wales Resource Distribution Formula	17 Area Health Services	Age; Sex; Ethnic Group; Homelessnes s	Mortality; Education level; Rurality	Private utilisation; Cross-boundary flows; Cost variation
Canada	Alberta Population Based Funding Model	17 Regional Health Authorities	Age; Sex; Ethnicity Welfare status	Remoteness	Cross-boundary flows; Funding loss protection; Cost variations
Finland	State Subsidy System	452 Municipalities	Age Disability	Archipelago Remoteness	Tax base
France	Regional Resource Allocation	25 Regions	Age		Phased implementation
Italy	Regional Financing Scheme	21 Regional Governments	Age Sex	Mortality	Damping mechanism
New Zealand	Health Funding Agency Population Based Funding Formulae	4 Regional Health Authorities	Age; Sex; Welfare status; Ethnicity	Rurality	Phased implementation
Norway	Local Government Finance System	19 County Governments	Age Sex	Mortality; Elderly living alone; Marital status	Tax base
Spain	Regional resource allocation system	7 regions			Cross-boundary flows Declining population adjustment
Sweden	Stockholm County Hospital resource allocation formula	26 county councils	Age; Living alone Employment status; Housing tenure; Previous in-patient diagnosis		Phased implementation
USA	Veterans Equitable Resource Allocation	22 Veterans Integrated Service Networks	Dependency (x2)	Labour costs	Phased implementation

Source: Rice and Smith (2001)

7. Discussion

This review has provided a summary of the literature sourced on resource allocation methods, the common indicators used in the resource allocation formula and manipulation thereof; and the experiences of different countries with the resource allocation methods. It has also provided a summary of the experience in Zimbabwe to date.

The review highlights that there is no universally accepted method for resource allocation, but that countries can adopt resource allocation methods that other countries are using depending on the data availability and quality. The level of sophistication in some of the resource allocation methods, especially those used in Europe reflects a data availability and institutionalisation of the resource allocation mechanism over some time. For new countries embarking on a resource allocation mechanism, stakeholders may want to review what is feasible and apply a mechanism that a) is most possible to apply and b) addresses policy principles.

In the absence of reliable and acceptable indicators of need it is useful to start with a simple needs based resource allocation indicator such as allocation based on population numbers that would be non-contentious and more manageable in a data limited setting as noted by Cooper (1975) in McInytre and Anselmi 2012). Gradual addition of new indicators would follow as the mechanism becomes more acceptable and more institutionalised. In most developing countries Demographic Health Surveys (DHS), Population Census data and to some extent Ministry of Health Information databases provide the most consistent data sets that can be used to model health need, however, they are not all representative below the provincial level and are also largely biased towards maternal and child indicators (Ensor et al 2012). The paper by McIntyre et al (2000) proposed the use of small areas analysis which has the advantage of enhancing homogeneity. The paper also states that small area analysis can also be taken in data poor context. An update on the merits of using a simple needs resource allocation formula is provide i n the needs based resource manual that was developed by McIntyre and Anselmi (2012) using their experience on resource allocation work in Mozambique. They propose the use of population as the first indicator of need and further propose the use of other indicators as and when the formula becomes acceptable and institutionalised.

When it comes to defining needs based resource allocation; there is no universal definition of the term ‘need’ (Gugushvilli 2007). According to Mooney (2004), relying on the needs based approach for resource allocation also needs to take into account the values and priorities of the community whose health needs are being serviced. This will not happen if authorities have the only say in the way resources are eventually allocated. The MoHCC in seeking to implement the needs based resources allocation formula will thus need to identify simple and feasible variables that can define ‘health need’ drawing on approaches used in other countries that are relevant, feasible and in line with available quality data and resources. Experiences from a range of countries show that the use of more complex indicators and formula may be challenging in data limited settings, where quality and availability of the required data may pose a challenge; hence use of simple, reliable and acceptable indicators to country stakeholders would be appropriate initially. Updated population based indicators are however now available in Zimbabwe since a number of national household surveys (population census, income and expenditure survey, poverty survey) have been carried out since 2010. It would be useful to use them in the formulation of an appropriate needs based resource allocation model.

Further in Zimbabwe, the essential health benefit (EHB) is currently being reviewed, updating the 1995 core services package. The intention is that it continue to be a comprehensive service

list, and not a more restrictive package limited to services for selected communicable diseases and maternal and child health (Ensor et al 2012). It is not yet clear, however, what the cost of the EHB is or whether it will be actively used as a norm for resource allocation. There is an opportunity to use it in resource allocation, however, such as in the analysis of gaps against services norms. The work on the EHB can provide the norms and cost of various services at the primary level for calculating the service and financial gaps, particularly within provinces to district level. A gap analysis will be carried out prior to the work on the resource allocation formula, to provide evidence on what service inputs are available at the district level against the EHB standards, as a guide for allocation of the resources within the public budget to the districts. Extra budgetary funds outside of the central government budget will not be included at this stage.

For the allocation to provinces, a formula for allocating resources in line with health need will need to weight indicators to take into account different population sizes, disease burden, gender and other factors. In Bangladesh weights on poverty and health outcomes have been assessed for use in resource allocation (Briscombe, et al, 2010). Weighting of indicators may be affected by political manipulation. For example, in Ghana the weightings for local government grants were manipulated to provide politically acceptable outcomes (Briscombe et al, 2010). The work will need to integrate stakeholder views in the prioritisation of indicators to this is done more transparently. Final allocations can also be affected by the choice and sensitivity of variables. Some countries have used utilisation levels as a proxy or indicator for future resource needs, but may fail to account for unmet needs emanating from those who need but do not use services.

Country experiences vary in terms of focus and implementation. Some countries only use the allocation method of recurrent expenditure, some are using it on local government funds and some are using the formula for allocating funds of reimbursement schemes. Some countries have not evaluated the impact of their resource allocation methods, while others that have evaluated have shown considerable shift of resources from the rich to the poor and vulnerable groups. What is common across all countries is the use of common demographic indicators such as population and geographic area for resource allocation, although there are differences in the weighting of these and other indicators. The simplicity of allocation methods used in the African countries is also evident, as compared to the complexity of the methods used by developing countries due to data quality and the limitations in accessing the right data. In the case of Zimbabwe, it would be useful to suggest a options for resource allocation models and indicators rather than focus on only one model, to provide policy choice on what model to adopt.

8. References

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