Equalising sub-national governments' spending needs in a developing country: the case of Tanzania

Decentralisation of government creates fiscal disparities: some sub-national governments can provide their citizens with more public services than others. Many countries try to equalise fiscal disparities by targeting grants at disadvantaged jurisdictions. This is especially difficult for developing countries, where data is scarce. We develop a method to estimate spending needs of local governments in developing countries. We apply this method to health spending by Tanzanian districts, but it can be used in other areas and other countries as well. We use our estimates to derive an equalising grant allocation formula. A comparison with the existing grant allocation indicates that more deprived districts should receive higher grants than they obtain now.

Key words: health spending, fiscal equalisation, spending needs, developing countries, intergovernmental grants

Introduction

The last decades have been characterised by a worldwide drive towards decentralisation of government. Decentralisation has been promoted based on different arguments: democracy and good governance, preservation of cultural and ethnic identity, and economic rationales (Rodríguez-Pose and Sandall, 2008). However, whether decentralisation yields a net benefit is uncertain. Decentralisation results in a smaller scale of government, which may lead to diseconomies of scale and of scope and to welfare-reducing spillovers (Oates, 1999; Prud'homme, 1995). Hence decentralisation may not necessarily generate greater economic growth (e.g., Akai and Sakata, 2002; Martinez-Vazquez and McNab, 2003; Rodríguez-Pose and Bwire, 2004), and possibly result in a less equitable distribution of wealth within a country (Silva, 2005). One thing is certain, however: decentralisation gives rise to fiscal disparities, and countries must find a way to handle these.

Fiscal disparities arise when sub-national governments are not able to produce comparable services at comparable tax rates. Fiscal disparities arise both on the revenue and on the expenditure side of the budget. Jurisdictions with a relatively prosperous population are

usually better able to finance public service provision than other jurisdictions, because they can raise more tax revenue. Spending needs, the expenditures needed to provide a certain standard level of public services, differ as well. In the first place, spending needs differ as a result of demographic reasons. For example, it is costly to provide health services in jurisdictions where the share of people needing medical care is higher than elsewhere. In the second place, it may be more costly to produce a standard package of public services in one jurisdiction than it is in others. Jurisdictions which are sparsely populated, e.g., may need more doctors per capita. As a result of fiscal disparities, access to public services, for example, medical facilities, differs between jurisdictions. This is often not considered desirable.

The obvious solution to the problem of fiscal disparities is to compensate jurisdictions with high expenditure need and low fiscal capacity (Ladd and Yinger, 1994). Some countries use equalisation grants to this end. In theory, central governments can thus ensure that every local jurisdiction is capable of providing a standard package of public services at standard tax rates. In practice, however, grant allocation is sometimes driven by political factors (e.g., Allers and Ishemoi, 2011).

Following Buchanan (1950), a body of literature on equalisation has emerged. Different countries use a bewildering spectrum of equalisation methods. Each tends to have different implication for equity, incentives, and distribution (e.g., Bahl et al., 1992; Blair, 1992; Ridge, 1992; Ladd and Yinger, 1994; Ma, 1997; Bird and Smart, 2001; Boadway, 2004; Ahmad and Searle, 2006). Although there is an abundant literature on the merits and standards of equalisation for various countries, the literature on how to practically equalise spending needs is remarkably dormant. The available literature focuses on developed countries, where

data on sub-national units is relatively abundant. In developing countries, limited data availability is a major problem in designing an equalisation system.

This paper is concerned with fiscal equalisation in developing countries, and focuses on Tanzania. Tanzania is a recently decentralised developing country characterized by considerable socio-economic disparities across districts. The rural population is poorer than the urban one, but differences among rural districts and among urban districts are substantial as well. Under these circumstances, decentralisation is likely to result in considerable fiscal disparities.

Local Government Authorities (LGAs)[1] in Tanzania mainly depend on grants from the central government to finance public service provision. This is partly explained by the fact that the country is still in its early stages of decentralisation, and by the fact that local tax administration in Tanzania is inadequate. In 2004, a formula-based grant allocation system was introduced, intended to reduce fiscal disparities. However, the formulas were not based an a study of spending needs, but rather on experts' opinions (Ishemoi, 2011). The transfer system includes block grants targeted at five priority areas: Education, Health, Water, Agriculture, and Roads. The Health block grant is one of the largest block grants to LGAs. The Local Government Finance Act Regulations states that the '…allocation should guarantee equitable access by the population to basic services…'.[2] This is a clear mandate for Tanzania to ensure that the transfer system equalises fiscal disparities of LGAs.

Equalisation has two components: equalisation of revenue-raising capacities and equalisation of expenditure needs. Spending needs are usually more difficult to measure than fiscal capacity (Shah, 2004). Fiscal capacity of Tanzanian local governments has already been estimated by Allers and Ishemoi (2010). This paper is concerned with spending needs,

focusing on health services. Tanzania is characterized by high levels of infant mortality and child malnutrition. Life expectancy at birth is estimated to be 51 (United Republic of Tanzania, 2005a). Maternal mortality is estimated at 578 per 100,000 live births. This is mainly caused by inadequate emergency obstetric care, access to antenatal care and delivery facilities (United Republic of Tanzania, 2005a). Under-five mortality is 133 per 1,000 live births. The country is characterized by substantial urban-rural, regional and socioeconomic differences. Rural poor children are more likely to die than their counterparts in urban areas. If they survive, they are more likely to be malnourished. For these reasons, financing local health services equitably is an important objective.

Our concern is the extent to which the current health block grant allocation enables LGAs in Tanzania to provide equitable access to basic services. We develop an indicator of health spending needs, and use this to derive a grant distribution system. We compare this with the present allocation, which was not based on a study of spending needs. The extent to which spending needs can be measured is limited by the availability of data, which is usually poor in developing countries. Tanzania is no exception. Thus, the challenge lies in using the available data to develop the best possible estimate.

Our contribution lies in the development of an equalisation grant for a developing country which has little data available. Existing studies in this field are overwhelmingly focussed on developed countries. The subject of our paper is important because the level and the quality of government services in more deprived areas of developing countries are exceptionally poor. This is especially true of health services in Tanzania, despite the government's and foreign donors' efforts to improve the situation. Better funding may be one way of

improving public health. Although we focus on health spending needs in Tanzania, our method may be used for other spending categories or for other developing countries as well. The paper is organized as follows. First, we provide a brief discussion of different approaches to measuring spending needs. Then, we offer an overview of the current grant allocation system in Tanzania. We subsequently describe our method for estimating spending needs and for deriving a grant allocation system to equalise spending need differences. The next sections apply this approach to Tanzanian districts, and compare our proposed grant allocation with the present allocation. The last section concludes.

Measures of Expenditure Needs

Spending need measures provide objective indications of the variation in expenditure needs that reflect not differences in actual spending decisions, but factors outside the control of local officials (Ladd 1994). These factors are attributable to variations in the costs of a certain public service level. This variation has two sources. In the first place, the costs of producing public services may vary. Input costs may differ between regions (e.g., as a result of regional wage differences), and variations in climatic or geographic characteristics may lead to different costs. In the second place, spending need varies as a result of differences in units of standardized services required per capita. This depends on the socio-demographic composition of the population for which LGAs are responsible. For example, it is costly to provide health services in jurisdictions where the share of people needing medical care is greater than it is in others. Similarly, jurisdictions with high crime rates need more protection than others.

The most challenging task in implementing expenditure needs equalisation is measuring these differences. Many different need factors are found in equalisation formulas for

different countries. Examples include number of school aged children, population density, urbanization, remoteness, unemployment, life expectancy, poverty, school enrolment, illiteracy, family composition and social assistance payments. For accurate measurement of spending needs, it is necessary to differentiate between the costs that are due to local policy decisions and those that are not. Only costs outside the control of the local government should be accounted for in the measurement of spending needs.

One of the simplest approaches is to rely on *historical expenditure patterns* (Boex and Martinez-Vazquez, 2004). Here, expenditure levels are to be adjusted in order to take account of inflation and other factors having an impact on jurisdictions' spending. This approach has the merit of simplicity. However, there is no guarantee that past expenditures reflect spending need. They may instead be determined by resource availability (e.g., the grant system itself) rather than actual spending needs. Similarly, for some countries, past observed expenditure for a particular service may not reflect current policy objectives (Bird and Vaillancourt, 2007). This may be due to changing expenditure norms and priorities. Furthermore, demographic and other changes lead to misalignments and inequities in service provision.

In cases where there are no data relating to local governments' characteristics, the last resort may be to assume that all local governments have *identical expenditure needs*. Once this assumption is made, each jurisdiction is allocated the same amount. Though simple to apply, the approach leads to significant variations in per capita resource availability. Alternatively, if data on population are available, then grants can be allocated on the basis of *equal amounts per capita*. This assumes that expenditure needs for individuals are the same regardless where they live. However, as we have seen, this is not normally the case.

The use of equal amounts per capita is sometimes combined with indicators which are thought to influence spending need, but of which the magnitude of the influence is unknown. *Expert opinion* may then be used to attach weights to these additional indicators. This method has been applied in Tanzania to arrive at the present grant allocation system, which will be described in the next section.

In order to find out which local characteristics influence spending need and to what extent, the *regression based cost approach* may be used. Actual expenditure is regressed on need indicators and other determinants of local expenditures such as preferences. This provides an estimate of the impact of those indicators on expenditures. The coefficients of the need indicators are then used to build an allocation formula, whereas the effect of non-need expenditure determinants is kept constant over jurisdictions (Ladd, 1994). There are many practical difficulties attached to this approach (e.g., Duncan and Smith, 1996). This approach requires accurate measures of expenditures of local jurisdictions and of relevant local characteristics that influence spending. In countries with poor data availability, this approach may not be feasible. Moreover, this method only works if actual expenditures are a good enough indicator of spending needs. In countries like Tanzania, where expenditures are to a large extent driven by resource availability (grants supply 91 per cent of local government revenues in 2006/2007),[3] this is not the case.

An alternative for the regression based approach is the *representative expenditure approach* (Ladd, 1994). This approach measures a jurisdictions' per capita expenditure need as the sum of its workload for each service weighted by average spending on each unit of service, divided by the population. This approach answers the question as to how much jurisdictions will spend per capita, given an average service level, the workload they face and the cost of

providing services. Here, considerable effort is required to obtain necessary data on workload factors, as well as knowledge on prices of inputs and factors affecting the scope of services to be provided. For Tanzania, this makes this approach impractical.

Grants and health services in Tanzania

There are two levels of government in Tanzania mainland: the central government, and 119 districts or LGAs (in 2002).[4] All districts have an elected council, which is responsible for setting tax rates and delivering local government services. As we have seen, grants are the main source of income for LGAs, amounting to 91 per cent of total revenue in 2006/2007. Prior to the financial year 2003/2004, grant allocation was ad hoc and discretionary. The gradual introduction of formula-based grant allocation was completed in 2006. Sector block grants were introduced in five priority areas: Education, Health, Water, Agriculture, and Roads. Next to these block grants, LGAs receive basket fund grants that are allocated in a similar way as block grants, a General Purpose Grant that covers general administration costs, and a Capital Development Grant for capital development expenditures.

The block grants allocation system is based on formulas developed by the Local Government Finance Working Group, which are set out in Table 1. In reality, however, parts of the block grants are still allocated through ministerial subvention rather than through the formulas (United Republic of Tanzania, 2006). LGAs which are better represented in the national parliament receive higher grants than other LGAs (Allers and Ishemoi, 2011).

<Table 1 about here>

Health care is an important responsibility for LGAs. In fiscal year 2006/2007, health grants formed 16 per cent of LGA grant revenue. However, since the beginning of the 1990s, expanding demand for services and declining service quality has led to the re-legalization of the private sector health services. The country experienced the introduction of user fees and cost sharing for public health facilities in the early 1990s (Laterveer et al., 2004). Frederickx (1998) reports that the reasons for poor health outcomes in Tanzania are lack of drugs, inadequate salaries to personnel and poor maintenance of government's health facilities. The government has attempted to construct a network of health centres and dispensaries closer to the villages. However, much effort is still required to improve the quality of health services in rural Tanzania, especially by retaining qualified employees and directing more funds towards rural and more deprived areas.

Method

Table 1 shows the current formulas used to distribute health and other block grants. The health formula includes population, poor residents, length of medical vehicle route and under-five mortality. The formula conforms to the generally accepted simplicity rule in resource allocation formulas. Simplicity is helpful in gaining political acceptance and enhancing transparency. However, the concern here is the extent to which the factors that are included in the grant allocation formula reflect spending needs of LGAs. The present formula was the result of negotiations based on expert opinions, not the result of a study of spending needs.

The existing formula encapsulates differences in demand and differences in operating costs. Operating costs are approximated by including the mileage of the route regularly travelled by medical vehicles. This takes into account the higher operational costs for health service

delivery in rural and scarcely populated areas. In Tanzania, these higher costs in rural areas are mostly attributable to drug distribution, immunization and supervision. Given data scarcity, length of medical vehicle route is probably the best available indicator of operating costs. Our aim is to improve on the way differences in demand are included in the formula. The best available methods for estimating spending needs are the regression based cost approach and the representative expenditures approach. As explained above, the second is not feasible for Tanzania. However, the standard regression-based approach cannot be applied to Tanzania either. Therefore, we adapt this method to make it more suitable to the Tanzanian case.

The standard regression-based approach uses actual spending as an indicator of spending need, and regresses possible cost variables along with other variables influencing spending on actual spending levels to determine the influence of individual cost factors. This may work in countries where LGAs are financed to a large extent by own tax revenue. Then, spending levels may be thought to be driven by spending need (and tax capacity). In Tanzania, LGAs are financed mainly through grants. Thus, a regression of actual spending would do no more than rediscover the existing grant allocation system. There is no direct link with spending need. Therefore, we had to identify a different indicator for spending need. We decided to use the under-five mortality rate, for reasons we discuss below.

A different problem is that there are many local characteristics that may influence spending need, which are to a large extent correlated. Including many correlated variables in a regression is problematic: it is impossible to determine the influence of the individual variables (multicollinearity problem). To solve this problem, we use factor analysis, which

has also been used, e.g., to derive spending needs for English local authorities (Chapman, 1996).

Our method consists of three steps, which will be described in detail below. First, we use factor analysis to construct several indices of deprivation, which summarize a number of variables thought to influence health spending need. Then, we regress these indices on under-five mortality rates, our indicator for health conditions. We use predicted values of this regression to construct an indicator of health spending need.

Step 1: Creating indexes of deprivation

Factor analysis may be used in cases where groups of indicators represent underlying influences on the variable of interest. The aim is to identify a set of variables which represents a wider range of characteristics. There are numerous variables that are likely to have an impact on the demand for health services. Many of these variables are highly correlated with each other. As a result, the influence of each individual variable cannot be determined through regression analysis (multicollinearity). Factor analysis can bundle these variables together in a limited number of composite indexes, or *components*, which are not correlated. Thus, it is possible to include a number of correlated variables. This makes the resulting grant distribution more robust. As it does not depend on few characteristics, it is less likely that a particular jurisdiction is affected by unrepresentative values of included characteristics (Chapman, 1996), or by measurement errors in a particular variable. Using many instead of few characteristics has the additional merit of making it more difficult for LGAs to influence their grant by strategic behaviour.

There are several methods of factor analysis. This paper uses Principal Component Analysis (PCA). PCA has been used before by researchers to measure deprivation levels (Carstairs,

1981; Chapman, 1996; Vella and Vichi, 1997; McIntyre, 2000; Klasen, 2000; and Thomas et al., 2002). PCA maximizes the variance in the correlation matrix explained by any number of factors. When using PCA, the components are automatically uncorrelated. This ensures that they can be used in linear regression models without having multicollinearity problems.

The current allocation formula distributes 10 per cent of the health block grant according to an indicator for operating costs (medical vehicle route) and 90 per cent through indicators of spending need. Spending need is thought to depend mainly on number of inhabitants (70 per cent of total grant allocation). Apart from this, 10 per cent is allocated based on the number of poor and on under-five mortality, respectively. Thus, higher than average spending need is thought to be limited to LGAs with a relative poor population and with high under-five mortality rates, with low weights attached to each.

Although it is generally recognized that disposable income is the key element in the resource available at the household level, it is by no means the only one. For example, Matkovic et al. (2007) argue that being poor is not only associated with lack of resources, but also with unsatisfied housing conditions, poor education or ill health. However, there is a complex link between ill health and poverty, because the causal relationship between the two runs both ways. It has long been recognized (e.g., Ringen, 1988) that low income may be a weak and unreliable indicator of poverty. Thus, in our analysis, we consider factors other than income poverty.

Under-five mortality seems to be a valid indicator of spending need. However, the weight that is currently attached to it in the allocation formula (10 per cent) seems low. Moreover, allocating grants based on such an indicator risks making it financially unattractive for LGAs to reduce under-five mortality rates.

Instead of relying on two indicators of spending need, as the present allocation formula does, we use factor analysis to derive indexes of deprivation based on a larger number of local characteristics. These deprivation indexes are then used as indicators for spending need. Deprivation means to be denied the opportunity to have or do something through an inability to obtain the goods, activities, and opportunities to participate which are generally assumed as appropriate in the community in question (Perez-Mayo, 2005). Broadly speaking, people are deprived if they lack the diet, clothing, housing, household facilities, education, working and social conditions, activities and facilities which are customary (Townsend, 1987). Deprivation strongly influences health; therefore it is of great importance in resource allocation (Groffen et al., 2007).

Earlier studies advocate the use of deprivation indexes in resource allocation, without further study. Thomas et al. (2002), e.g., suggest using a resource allocation formula in South Africa based on the population of each district, weighted for deprivation. However, before using our deprivation indexes, we want to establish that these indexes do indeed have an impact on the demand for health services. Moreover, we need to know the strength of this impact. That is why we include step two.

Step 2: Regression analysis of demand for health services on deprivation indexes

The second step involves estimating the influence of the composite deprivation indexes on the demand for health services. Chapman (1996) regresses these indexes on expenditures. For Tanzania, as we have seen, this would not be appropriate, as expenditures reflect grant revenue not spending need. Therefore, we had to find another indicator. It is here that the data limitations we encounter in this study are most severe. We need an indicator of the need for health services for which data are available at the district level. The best we can find is

the under-five mortality rate. We assume that it is likely that in areas where under-five mortality rates are higher, the need for health services in general will be higher as well. There is some evidence that mortality is related to morbidity, which in turn affects demand for health services (Brennan and Clare, 1980).

We are aware of the fact that mortality rates may be measured with different accuracy in different areas. Registration is bound to be better in less poor and in urban areas. This means that differences in registered mortality rates are likely to underestimate actual differences. Our results therefore are liable to underestimate true fiscal disparities. However, better data is simply not available. The only available alternative is the share of the population with a disability. However, this variable reflects health conditions in the past. In Tanzania, disability is often the result of a disease people have suffered a long time ago, which is less relevant for current health spending needs. We need an indicator reflecting the present (or, at least, the recent past). Therefore, we prefer under-five mortality over the share of disabled persons.

We regress under-five mortality on the deprivation indexes derived in step one, in order to establish whether these indexes are good enough predictors of under-five mortality. If the indexes prove to have a significant influence on under-five mortality, the regression coefficients can then be used to construct the weights of the allocation formula.

In theory, under-five mortality rates could also be used directly as the basis for health grant allocation. This would, however, create a perverse incentive for local government not to try to reduce under-five mortality. Districts succeeding in reducing under-five mortality would in fact be punished for their success by a reduction of allocated health grants. Therefore, we prefer to use a set of variables, not just one. Also, a sufficient number of these variables must

be relatively difficult to influence directly by local governments. Otherwise, districts would be able to manipulate their own grant.

Step 3: Deriving spending needs and grant allocation

The third step is to use the regression results from step two to derive an indicator for health spending need, and to base a grant allocation system on this spending need indicator. If the deprivation indexes prove to have a significant influence on under-five mortality, estimated (not actual) under-five mortality may be used to construct an index of spending need. This is done by dividing estimated under-five mortality for individual LGAs by the national average. This creates an index with mean value one. LGAs with values above one have high spending needs; LGAs with values below one have low spending needs.

As explained above, we propose to allocate 90 per cent of health grants on the basis of our spending need index, and the remaining 10 per cent on the basis of the presently used medical vehicle route index. The medical vehicle route formula weight (10%) is the same as in the existing formula; assessing this weight is outside the scope of this paper. The proposed formula based on health spending need takes the following form:

$$G_{ni} = 0.9G\,{}^{P_i}\!\!\diagup\!\!{}_{P}\,N_i \qquad (1)$$

where:

G_{ni} = Grant based on spending needs for district *i*;

G = Total health grant amount available for allocation;

P_i = Population for district *i*;

P = Total population;

N_i = Calculated spending need index based on deprivation for district *i*.

The formula based on the road mileage index takes the following form:

$$G_{ri} = 0.1R_i \, G/D \qquad (2)$$

where

G_{ri} = Grant based on road mileage index for district *i*;

R_i = Road mileage index for district *i* (district road mileage divided by average road mileage);

D = Total number of districts.

Summing up G_{ni} and G_{ri} in equation 1 and 2 gives the total health grant for each district G_i:

$$G_i = 0.9G \, P_i/P \, N_i + 0.1R_i \, G/D . \qquad (3)$$

Results

Indexes of deprivation

A number of both socioeconomic and demographic variables were used to construct indexes for deprivation in Tanzania. The data were obtained from the 2002 Population and Housing Census.[5] When the last census was conducted there were 119 districts in Tanzania. Because data were missing for two districts, 117 districts are included in this study.

To construct health deprivation indexes, groups of indicators were identified using PCA. From these groups, representative indicators or *components* were identified. A component is a linear combination of variables that accounts for as much variation in the original variables as possible. Several selection criteria were applied to identify suitable indicators of deprivation in the country. One of the criteria was to ensure that the selected indicator is a plausible measure of deprivation. Family composition, income sources and housing tenure all have a direct association with deprivation and some apparent effects of income are explained by these factors (Berthoud et al. 2004). Furthermore, deprivation indicators need to be available for every district, and they have to be outside the (direct) control of districts' authorities. We constructed a dataset of the available variables which conform to these criteria.

In order for PCA to provide useful results, variables for analysis should be highly correlated. That is because if variables are poorly correlated, they are unlikely to belong in the same index. However, if they are too highly correlated, they are equally unsuitable. This is for two reasons. First, adding more highly correlated variables adds less to the explanatory power of the final regressions. Second, it distorts the component coefficients on other variables. For this purpose, we calculated Pearson correlation coefficients of the variables in our dataset. Only variables which have a correlation coefficient with at least one other variable of at least 0.5, and no correlation coefficient with another variable higher than 0.9, were considered for analysis. Table 2 lists the remaining variables.

On these variables, a PCA was performed. The identified components were rotated using varimax rotation with Kaiser normalization to identify the set of variables that are most important for each of the components. The component rotation phase helps to define the

most important variables within each component, each component having a common theme such as social deprivation, economic status or housing conditions. To decide how many components to select, we used a Scree plot, which shows the additional variation explained by each component. As a result, all components considered duplicating the information were dropped from the final analysis. Consequently, components with higher loadings were selected.

Table 2 shows the two indexes, or components, we constructed, which together represent 76 per cent of the total variation in the data. The bold values in Table 2 highlight the variables which are the most important for each of the components. These define the character of each component.

<Table 2 about here>

From Table 2, it appears that deprivation in Tanzania is mainly driven by socio-economic conditions (Component 1). These account for about 59% of the total variation in the data. In addition, demographic characteristics (Component 2) reflect about 17% of the total variation in the data.

For each LGA and each component, we computed the component score by multiplying the LGA's standardized variable values by the component's score coefficients. The resulting two *component score variables* are representative of the ten original variables with only a 24 per cent loss of information.

Deprivation and the demand for health services

The following regression model was estimated in a linear form:

$$M_i = \beta_1 + \beta_2 S_{1i} + \beta_3 S_{2i} + \varepsilon_i \quad (4)$$

Where:

M_i is the under-five mortality rate in district *i*;

S_{1i} is the value of the socio-economic component score variable (derived from component 1 in Table 2) in district *i*;

S_{2i} is the value of the demographic component score variable (derived from component 2) in district *i*;

$\beta_1, \beta_2, \beta_3$ are parameters to be estimated; and

ε_i is the error term.

This step is important in order to identify whether the component score variables are in fact related to health conditions in Tanzania, that is, whether they are significant or not. Since the regressors on the right hand side of the model were constructed, we used the bootstrap method to derive standard errors. The results in Table 3 show that the component score variables are highly significant. This suggests that the component score variables we derived are indeed useful indicators for health conditions in Tanzania.

<Table 3 about here>

Spending needs and grant allocation

Both component score variables were used to estimate under-five mortality rates for districts. The estimated under-five mortality rate for each district was then divided by the national average in order to construct a spending need index.

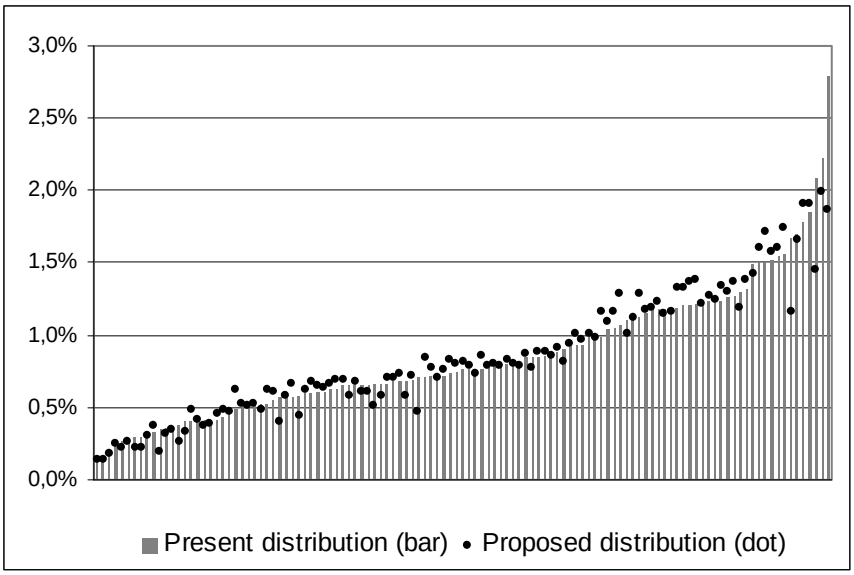
<Table 4 about here>

The formula in (3) is applied to derive health grants per district for fiscal year 2005/2006. The results are listed in Table 4, along with the present allocation. For ease of interpretation, the grant allocations in Table 4 are expressed as percentages of the available budget G, not in Tanzanian Shillings. The subsequent section discusses the effects of the proposed formula on health grant allocation in Tanzania.

Redistribution effects of the proposed formula

The proposed formula produces interesting results. Some LGAs would gain considerably from introducing the proposed formula whereas others would lose. Figure 1 compares the health grant allocation according to the existing formula with the allocation based on the proposed formula. The Figure shows the percentage shares of the districts in the total health grant.

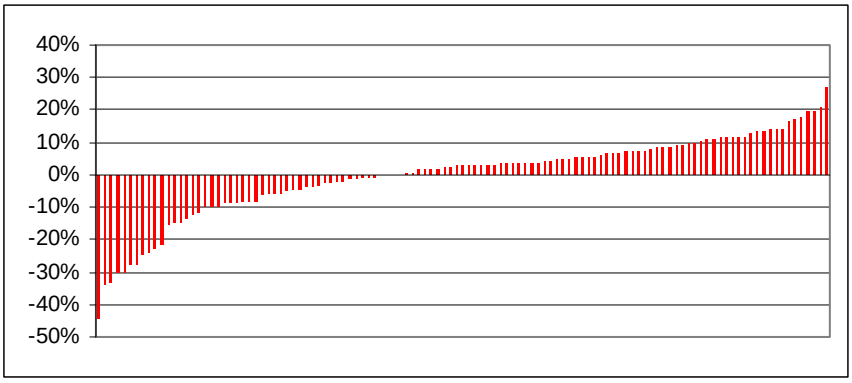
Figure 1. Comparison of existing health grant distribution with proposed distribution (percentage shares of districts in total health grant, in ascending order)



As it turns out, the proposed allocation differs considerably from the present one. This may be seen more clearly from Figure 2, which depicts the gains and losses per district of moving to the proposed allocation. Ngorongoro district, which would see its health block grant increase by 27 per cent (Table 4), is on the extreme right hand side in this Figure, while Moshi Urban district, which would see its health grant drop by 44 per cent, is on the extreme left. Generally, rural and poor districts stand to gain from the proposed allocation, while urban and relatively affluent LGAs would lose. This is as expected. Figure 2 suggests that if the government implements the proposed formula, some LGAs have to be held harmless during the initial phasing-in stages.

Although the grant redistribution that would follow the adoption of the proposed allocation formula is considerable, it should be kept in mind that our measure of spending need probably underestimates true fiscal disparities between LGAs. This is because, as discussed above, under-five mortality data are likely to suffer from under-reporting in more deprived regions.

Figure 2. Gains and losses per district of introducing the proposed allocation (per cent of grant received)



Conclusions

This paper aims at estimating health spending needs of local governments in Tanzania. It focuses on the health sector due to its importance and because of the government's priority towards improving health services. Because of limited data availability, methods used earlier to study spending needs in developed countries have only limited applicability in developing countries. Although this paper focuses on health spending grants in Tanzania, the methodology could be used for other sectors (e.g., education) and other developing countries as well.

We use factor analysis to measure the geographical patterns of deprivation among districts in Tanzania. The influence of deprivation on health spending needs is estimated through regression analysis. Here, the rate of under-five mortality per district is taken as a proxy for health service demand. The estimated mortality rates are used to derive a health spending need index, which is employed to design the allocation formula that considers both health service demand and operating costs.

At the moment, health grants are allocated through a formula that was not based on a study of spending needs. Seventy per cent of the grant money is currently allocated on an equal per capita basis. The proposed formula for health grants was compared with the existing one. The results reveal considerable differences between the present and the proposed allocation. Rural and poor districts stand to gain from the proposed allocation, while urban and relatively affluent LGAs would lose.

Better funding may be one way of improving public health services. However, it would be naïve to assume that this would be enough. Currently under-resourced LGAs must be helped to absorb the increased budgetary allocations. The most under-resourced areas are likely to have the least management capacity. Thus, budget redistribution must be accompanied by capacity development in order to be effective (McIntyre et al., 2000).

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Table 1. Formula-based grants: Allocation formulas for 2006/2007

Grant	Allocation Formulas	Per cent
Primary Education	Number of school aged children	100
	Earmarked amount for special schools	
Health	Population	70
	Number of poor residents	10
	District medical vehicle route	10
	Under five mortality	10
Agriculture	Number of villages	80
	Rural population	10
	Under five mortality	10
Water	Equal shares	10
	Number of un-served rural residents	90
Local Roads	Road network length	75
	Land area Capped	15
	Number of poor residents	10
General Purpose Grant	Fixed lump-sum	10
	Total number of villages	10
	Total population	50
	Total number of rural residents	30
Capital Development Grant	Total population	70
	Number of poor residents	20
	Land area (capped)	10

Source: United Republic of Tanzania (2006)

Table 2. Rotated component matrix

	Component 1	Component 2
% Household using piped or protected water source	**-0.797**	0.178
% Households using flush toilets or ventilated improved pit latrine	**-0.871**	-0.053
% Household owning a radio	**-0.832**	-0.102
% Households having earth floor	**0.965**	0.012
% household having poor quality roofing	**0.928**	-0.126
% Population with disability	**0.553**	0.279
% Hand hoe used by most people	**0.899**	-0.152
% Children under 18 who are orphaned	-0.273	**0.861**
% Widowhood females	0.135	**0.909**
% People aged 15 and older who are illiterate	**0.856**	-0.243
Percentage of variance	58.6	17.4
Cumulative percentage of variance	58.6	76.0

Table 3. Regression results

Variable	Coefficient	t-value	Significance
Socio-economic component score variable	23.0	7.97	0.000
Demographic component score variable	8.5	3.43	0.001
Constant	154.5	45.72	0.000

Dependant variable: Under-five mortality rate; adjusted R^2: 0.34. Three observations were excluded as under-five mortality rates reported for these districts (Monduli, Ngorongoro and Simanjiro) are unrealistically low.

Table 4. Present and proposed health grant allocation (% shares of total grant available)

District	Present share	Proposed share	District	Present share	Proposed share
Arumeru	1.30%	1.19%	Mbozi	1.50%	1.60%
Arusha Urban	0.70%	0.46%	Mbulu	0.71%	0.78%
Babati	0.85%	0.88%	Meatu	0.86%	0.88%
Bagamoyo	0.78%	0.79%	Misungwi	0.79%	0.80%
Bariadi	1.85%	1.91%	Mkuranga	0.64%	0.69%
Biharamulo	1.22%	1.21%	Monduli	0.57%	0.67%
Bukoba Rural	1.06%	1.28%	Morogoro Rural	0.77%	0.85%
Bukoba Urban	0.21%	0.17%	Morogoro Urban	0.58%	0.45%
Bukombe	1.18%	1.14%	Moshi Rural	1.10%	1.01%
Bunda	0.85%	0.78%	Moshi Urban	0.35%	0.20%
Chunya	0.67%	0.71%	Mpanda	1.19%	1.17%
Dodoma Rural	1.56%	1.74%	Mpwapwa	0.81%	0.83%
Dodoma Urban	0.89%	0.82%	Mtwara Rural	0.66%	0.71%
Geita	2.22%	1.99%	Mtwara Urban	0.26%	0.22%
Hai	0.64%	0.58%	Mufindi	0.92%	1.02%
Hanang	0.61%	0.65%	Muheza	0.89%	0.92%
Handeni	0.87%	0.86%	Muleba	1.13%	1.29%
Igunga	1.03%	1.09%	Musoma Rural	1.11%	1.11%
Ilala	1.67%	1.17%	Musoma Urban	0.30%	0.22%
Ileje	0.42%	0.45%	Mvomero	0.76%	0.82%
Iramba	1.19%	1.33%	Mwanga	0.37%	0.34%
Iringa Rural	0.73%	0.83%	Nachingwea	0.52%	0.52%
Iringa Urban	0.30%	0.22%	Namtumbo	0.66%	0.60%
Kahama	1.70%	1.67%	Newala	0.59%	0.62%
Karagwe	1.23%	1.34%	Ngara	1.05%	1.16%
Karatu	0.57%	0.58%	Ngorongoro	0.49%	0.62%
Kasulu	1.78%	1.91%	Njombe	1.28%	1.37%
Kibaha	0.41%	0.39%	Nkansi	0.72%	0.70%
Kibondo	1.22%	1.38%	Nyamagana	0.56%	0.41%
Kigoma Rural	1.55%	1.60%	Nzega	1.22%	1.28%
Kigoma Urban	0.40%	0.34%	Pangani	0.26%	0.26%
Kilolo	0.63%	0.69%	Rombo	0.66%	0.58%
Kilombero	0.92%	0.94%	Rufiji	0.67%	0.74%
Kilosa	1.53%	1.57%	Rungwe	0.99%	1.16%
Kilwa	0.61%	0.64%	Ruangwa	0.41%	0.42%
Kinondoni	2.79%	1.87%	Same	0.65%	0.61%
Kisarawe	0.33%	0.37%	Sengerema	1.49%	1.43%
Kishapu	0.70%	0.72%	Serengeti	0.65%	0.68%
Kiteto	0.56%	0.61%	Shinyanga Rural	0.84%	0.87%
Kondoa	1.20%	1.33%	Shinyanga Urban	0.36%	0.31%
Kongwa	0.76%	0.73%	Sikonge	0.51%	0.52%
Korogwe	0.80%	0.78%	Simanjiro	0.46%	0.47%
Kwimba	0.93%	0.96%	Singida Rural	1.20%	1.37%
Kyela	0.53%	0.63%	Singida Urban	0.33%	0.31%
Lindi Rural	0.76%	0.78%	Songea Rural	0.52%	0.52%
Lindi Urban	0.15%	0.14%	Songea Urban	0.37%	0.27%
Liwale	0.27%	0.27%	Sumbawanga Rural	1.26%	1.29%
Ludewa	0.43%	0.48%	Sumbawanga Urban	0.41%	0.37%
Lushoto	1.18%	1.23%	Tabora Urban	0.53%	0.48%
Mafia	0.15%	0.14%	Tandahimba	0.62%	0.67%
Magu	1.23%	1.24%	Tanga Urban	0.66%	0.52%
Makete	0.40%	0.48%	Tarime	1.51%	1.71%
Manyoni	0.72%	0.77%	Temeke	2.08%	1.46%
Masasi	1.32%	1.39%	Tunduru	0.82%	0.81%
Maswa	0.98%	1.01%	Ukerewe	0.82%	0.79%
Mbarali	0.74%	0.80%	Ulanga	0.60%	0.68%
Mbeya Rural	0.71%	0.85%	Urambo	1.14%	1.18%
Mbeya Urban	0.68%	0.59%	Uyui	0.98%	0.98%
Mbinga	1.17%	1.20%			

Notes

[1] The paper uses the terms LGAs and districts interchangeably to mean all jurisdictions governed by Municipal, Town and District Councils in Tanzania.
[2] Government Notice 282, of 2000.
[3] Source: United Republic of Tanzania (2007).
[4] The 21 regions do not form a separate government level; these are deconcentrated departments of the central government. The islands community of Zanzibar has a high degree of autonomy and is not included in this study.
[5] United Republic of Tanzania (2005b, Appendix Table A.9).