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Abstract

While many constraints facing the health sector can be relaxed through the injection of new health sector resources, a lack of money is not the only problem facing the health sector in low and middle income countries. Poor countries differ according to the type and level of constraints they face. We argue that it is important to understand the full range of constraints that influence the use and provision of health services in specific settings when making strategic choices about how to scale-up key interventions to improve the health of poor people. This paper presents a conceptual framework for understanding constraints which is based on the level at which a constraint operates, the nature of the constraint, and its amenability to buy-out in the short term. Cross-sectional data is used to identify proxy measures of these constraints in order to categorise countries according to the type and level of constraint they face. An overall index of constraints is created, which includes variables reflecting demand, health system strength, and environmental characteristics including both governance and geography. Measures of government commitment to the health sector, and the distribution of key health sector inputs are explored but excluded from the index. A typology of countries according to the constraints they face can feed into the estimates of the cost of scaling up interventions, the choices of how to delivery priority interventions, and, potentially, of which countries should be the focus of early efforts.

1. Introduction

The task of Working Group 5 (WG5) of the Commission for Macroeconomics and Health is to consider how best to achieve a dramatic improvement in the health outcomes of the poor over the next 5, 15 and 25 years. This involves three main tasks:

- *identifying the set of interventions that will significantly improve the health of the poor in a relatively short time period*

- *considering the factors which will hamper the widespread implementation of these interventions amongst the poor, and the options that are available to deal with these*
- *estimating the total costs of scaling up and sustaining interventions in differing, but generalizable, scenarios*

The record of success in delivering health services to the poor in low-income countries is mixed. Clearly, overall resource availability is a key constraint: in resource-poor environments, it is impossible to deliver more than a minimal level of services. In addition, a shortage of resources can lead to considerable inefficiencies in the use of the existing resources. For example, the tendency of governments to protect salaries at the cost of the availability of complementary inputs such as drugs, medical supplies and maintenance, means that the time of health workers cannot be fully utilised (1). To address this fundamental shortage of funds, the Commission is likely to recommend a dramatic increase in international spending on health in poor countries, in order to increase the scale and quality of health service delivery.

Money, however, is not the only problem. One indication that other factors shape the success of governments in improving health status is that a number of countries have succeeded in improving health status well beyond the level that would be expected given the resources available (2,3). Analysis of the experience of these countries suggests that government commitment to spending on basic services such as education and health, and the form this spending takes (in terms of the focus on services that are likely to be used by poor people) are critical. In addition, education levels, especially those of women, have been shown to be particularly important in translating social sector spending into improved health. Thus, in considering the feasibility of scaling up key health interventions, it is critical to consider non-financial variables, including those that lie outside the direct control of the health sector.

More generally, a rapid scaling up of interventions to improve the health of the poor requires that significant constraints to government action be identified and addressed. We define constraints to mean factors that restrict or limit the pursuit of desired outcomes or goals. They are defined to be broader than inputs *per se*, and can also include processes or functions.

In this paper we argue that many of these constraints, whether they relate to inputs or systems, can be substantially relaxed through the injection of new health sector resources. However, other constraints are likely to prove less amenable to buy-out in the short-to-medium term. For instance, they may operate at levels outside the control of the health sector; a long lead-time may be required for new investments to produce observable improvements; or the difficulties may be rooted in characteristics of the social and political environment that are relatively fixed over the time horizon being considered.

The type and depth of constraints will have important implications for the choice of health service delivery strategies adopted, and the pace with which such scaling up can be achieved. Specific investments in strengthening health systems may, for example, improve the capacity of the system to plan and deliver services within the public sector. Reforms at the sector level may strengthen incentives for efficiency and responsiveness, e.g. reforms such as contracting (4,5), decentralisation of decision making (6), and increased autonomy for health providers (7). Where systems are especially weak, and political commitment to improve them is absent, it will be necessary to consider options for delivering health services outside the formal (public) health system; these options could include social marketing, or contracting with NGOs and private providers. The costs of any of these types of intervention need to be included in the calculation of the bill for scaling up coverage. A final potential use of this analysis is to consider the sequencing of activities, which might include the

identification of countries to be the focus of early efforts to scale up interventions, and potentially, the interventions to receive early attention.

A necessary step in addressing the challenge of scaling up interventions is therefore to understand the range and intensity of constraints that apply in specific contexts. Two inputs are needed: First, an analytically useful characterisation of constraints; and second, a typology of countries according to the range and intensity of constraints they face. This country categorisation will help to inform the choice of strategies for delivering interventions at a dramatically scaled-up level.

Related work

Two pieces of work being undertaken by Working Group 5 complement this characterisation of constraints and categorisation of countries, and will shortly be available. First, a systematic literature review has been undertaken of the evidence on interventions to improve peripheral health systems (8). Second, case studies have been commissioned in Chad, Tanzania and India to examine country experience with constraints and with interventions to relax them (9,10,11).

Structure of the paper

The paper is structured as follows: Section 2 presents the conceptual framework for the characterisation of constraints. Section 3 describes the process we have adopted for measuring constraints. Results are presented in Section 4 for analysis of individual constraint variables, and in Section 5 for the construction of a “constraints index” which is used to create a typology of countries describing them as least and most constrained. Section 6 describes the analysis that has been performed to examine the sensitivity of the country groupings to different assumptions and variables. Section 7 presents summary evidence on a number of other variables which have not been included in the index, but which capture

additional constraints to scaling up in specific settings. Section 8 considers the “face validity” of the constraints index by examining the relationship between constraints and health outcomes. Section 9 discusses further uses of the country classification exercise, together with its limitations. Section 10 concludes.

2. Conceptual framework

Analysis of the range and intensity of constraints requires a consistent conceptual framework for classifying constraints. The framework should also be policy-relevant, in the sense that it directs attention to the type of efforts required to relax constraints, and to where responsibility for undertaking such interventions might lie. To represent these concerns, three dimensions have been identified:

- a. The level at which a constraint operates:* Constraints may operate at different levels, ranging from the household/community, through health service delivery, health policy, central government/cross-sectoral, and overall environment. The significance of this dimension lies in the extent to which any needed changes are within the control of the Ministry of Health (e.g. health service delivery or health policy levels) or not (cross-sectoral or geographic/social/political levels).
- b. The nature of the constraint:* An approach which lends considerable analytic power is to consider a production function for health services, in which outputs, measured ideally in terms of health improvement, but more indirectly as health services, are determined by inputs, technology and socio-political environment.¹² For the purpose of this analysis, the usual concept of technology is defined more broadly to include the techniques of

¹ We are very grateful to Howard Barnum who suggested the production function approach to classifying constraints. This section draws heavily on a briefing note that he prepared for the constraints and costing teams of WG5.

production, the incentives facing actors in the system for efficient and effective (including responsive) production of health services, and certain elements of the socio-political structure. These are assumed to be amenable to change over time. We distinguish between these and other dimensions of socio-political structure which, while open to exogenous change, may be fixed over relatively long periods of time, or may be subject to a high level of uncertainty as to the time frame over which change can be expected. The production function can be summarised as follows:

$$f(y_1, y_2, \dots, y_n; x_1, x_2, \dots, x_m; z_1, z_2, \dots, z_p; t; s)$$

where y_i are outputs; x_j are variable inputs; z_k are fixed inputs over a defined period of time, t represents the state of technology and socio-political structure that is amenable to change over time and s represents the state of socio-political structure that is not amenable to planned change over time and must be taken as given.

- c. *Amenability to buy-out in the short term:* A relatively simplistic approach to considering the degree to which additional funds can relax constraints would be to argue that constraints imposed by the supply of variable inputs are amenable to buy-out in the short term; that fixed inputs can be bought out in the medium-to-long term; that technology can change quite rapidly; but that it may be impossible to bring about changes in the broader socio-political structure through money alone. We argue, however, that this approach needs to be carefully qualified, and that in practice a more complex conceptualisation is required that takes into account interactions among the different arguments in the production function. For instance, while additional funds may be used to purchase more inputs in the short term, the deployment of these inputs (e.g. additional staff, better paid)

² It should be noted that it is not the aim of this analysis to assess the performance of the health system in the sense of the 2000 World Health Report analysis, but to understand the nature and magnitude of the constraints facing health systems.

to the benefit of priority interventions and target populations will depend on the level of political commitment to health improvement and poverty alleviation. In other words, interactions between X or Z and S need to be considered.

The following set of matrices represent a first effort to synthesise these features of a categorisation of constraints.

(I. Community and household level table about here)

(II. Health services delivery level table about here)

(III. Health sector policy and strategies table about here)

(IV. Public policies cutting across sectors table about here)

(V. Environment characteristics table about here)

A number of issues emerge from this set of tables. First, a whole range of constraints will be difficult to overcome through the injection of additional resources. Many of these are at the higher levels which lie outside the scope of health sector action. However, there are some constraints even at the health services delivery level and health policy and strategic management level which require more than money to resolve. Second, there are important interactions between the different elements of the production function, especially between the availability of incremental inputs (a financial constraint) and their deployment in favour of interventions that will improve the health of the poor. An eye must be kept to these sociopolitical factors when considering how additional resources will be spent – in terms of the choice of interventions, the nature of delivery strategies adopted for scaling up interventions and, potentially, the choice of countries to focus initial efforts.

Informing strategic choices

The primary use of a constraints typology is to shed light on *how* best to scale up key health interventions in order to improve the health outcomes of the poor. How, then, can this framework be used to inform the choice of strategies for scaling up in different contexts?

A critical factor will be the identification of which constraints are binding. A number of different situations can be distinguished, together with some of the ways in which strategies for scaling up interventions can be adapted to specific circumstances.

a) Well-functioning health system.

Where existing health systems are functional but coverage is limited due to resource constraints, any incremental resources and gains from improving efficiency should be used to expand the existing system.

b) Well-functioning health system with binding demand constraint

We would suggest that this situation is rarely generalised in a country. Often, demand is low for specific services (e.g. family planning) or specific population groups (e.g. ethnic minorities who are ill catered-for by existing service delivery modes), but more often, low demand is due to the poor quality of services in relation to the costs of accessing them.

Where a health system delivers adequate quality and value (in relation to monetary and time costs of accessing the system), there is usually demand for key services. Therefore, many of the problems are actually supply-side problems. Nonetheless, it is critical to take account of patterns of demand when designing intervention packages. For instance, in order to attract individuals to health facilities for specific preventive interventions it may be necessary to offer a more comprehensive range of curative services.

It is also important to consider complementary interventions to expand demand for specific services. These might include traditional health education, community-based education and information, or social marketing to stimulate the demand of specific population groups.

More generalised interventions to improve population-level education levels, especially those of women, will be outside the control of health ministries.

Complementary interventions to improve the quality of health services will generally need to accompany such demand-increasing measures. Attention should be paid to the needs and perceptions of any specific groups with low demand, for example, improving the supply and training of female health workers in areas where sociocultural factors prevent women from consulting male health workers.

c) Poorly-functioning health systems, where constraints can easily be bought off

In some contexts health systems are less than fully functional, but this is due primarily to systems failures that can be overcome through the injection of new resources. This may

involve investment in interventions directly targeted at strengthening systems, especially at the peripheral level. Tanzania provides an example of such a situation, where there is adequate infrastructure, but a need for both better distribution of existing resources and the injection of additional resources. A systematic review of the evidence on the effectiveness of interventions to strengthen peripheral health systems has been undertaken for WG5 (8). Such interventions may include management strengthening, training, quality assurance, etc. Alternatively, sustained improvements in health service delivery may require investment in broader health sector reforms, e.g. decentralisation, contracting, administrative reforms, improved donor coordination and collaboration. Finally, the potential may exist to choose strategies for delivering health interventions that, while remaining under the overall organisational oversight of the public sector, make fewer demands on the peripheral health system. This could include, for example, delivering certain vaccines through national vaccination days, or contracting between the government and NGOs to deliver services to population that are not covered by the public health system.

d) Health system functioning poorly, and constraints cannot be bought off in the short-to-medium term

Such a situation may arise from broader problems of weak governance, political instability or external threats to security. In such circumstances, delivery modes that are demanding of government capacity cannot be relied upon to achieve rapid expansion of coverage. Many of the above intervention delivery strategies will, therefore, not be feasible. For instance, contracts between government and NGO providers are unlikely to result in satisfactory outcomes because contracting is actually very demanding on government capacity, requiring specific skills for drawing up and monitoring contracts (4). The potential for greater reliance on the for-profit private sector will be limited by the lack of capacity to formulate appropriate policies towards private providers and to enforce them.

It may be feasible in these contexts for donors to work directly with parts of the private sector, particularly with NGOs where problems of opportunism may be lower and there may be stronger alignment of incentives and objectives. Alternatively, it may be possible to engineer alliances between NGOs and for-profit private providers. There are a limited number of models of this type based on “social franchising” of reproductive health services. However, these are in quite early stages, and limited evidence exists on their feasibility, outcomes, and generalisability. There are also concerns about the range of interventions to which such a model can be applied (12). It is likely to be easier to franchise services which are more homogenous in nature.

Another model which could prove feasible in highly constrained situations is to initiate scaling up by focusing on a narrow range of interventions that can be “commodified” and delivered through the private commercial/retail sector using a social marketing approach. To date, this has been done with family planning commodities, condoms, pre-packaged STI treatment (ref to Uganda clear 7 work), and, most recently, insecticide-treated nets (13,14). More thought is required about what other services can be made into products and delivered through the retail sector to achieve rapid impact in the absence of functioning public systems

While in the short term, opportunities to work within government systems may be limited in these environments, in the longer term it may be possible to support improvements in government performance through more demanding and comprehensive approaches to reform. These may include building new infrastructure, civil service reform, and accountability improvements that may lead to more sustainable outcomes.

The analysis presented in Section 4 aims to show how relatively simple data analysis can help to inform a “strategic typology” which can help to identify countries falling into each of these 4 groups, and therefore shape the scaling up strategies which are adopted.

3. Measuring constraints

Different countries exhibit different levels and types of constraints. The extent to which a health system is constrained by the demand side, health systems, and broader contextual factors will have implications for a number of key choices in strategies to improve the health of the poor. In order to feed into the process of identifying delivery strategies and estimating the costs of scaling up, we have sought to measure the degree to which countries are constrained, classifying countries into a number of different groups of countries based on levels of constraints. Such a country classification would form the basis for a discussion about how the level of constraints experienced by a country, and the nature of these constraints, will influence the choice of strategies for scaling up interventions, together with the costs and pace of scaling up.

A number of methodological challenges are faced in an effort to measure constraints at the country level. One key difficulty is presented by the multidimensionality of the construct. Decisions need to be made about how to capture the different dimensions, what variables to include, and how many can feasibly be considered. In addition, capturing the multiple dimensions requires some form of index, but this raises the additional issues of aggregation and weighting. The way these are handled is described below.

A second difficulty is the availability of valid measures or proxies of the elements in the framework for a range of low-income countries. In practice, the choice of variables for measuring constraints is driven at least as much by the availability of data as by any higher level considerations of measurement.

A final difficulty is posed by the choice of data source to use when multiple sources are available. For instance, there are at least three different sources of data on vaccination coverage, all for different years and with different country coverage. Internal discussions within the WG5 team and external consultations have taken place, to determine which data sources are likely to be most valid. In addition, some sensitivity analysis has been undertaken on alternative data sources to ensure that the country classification is not unduly influenced by the choice of data source.

a) Which dimensions?

Ideally, the measurement of constraints should capture each of the five dimensions of the conceptual framework described above. However, variables capable of proxying 2 of the dimensions (health sector policy and cross-sectoral policy) for a cross-section of low and lower-middle income countries, have proven elusive. We have therefore limited our analysis to three dimensions: community/household level; health service delivery; and overall environment.

b) Which variables?

Community/household level: The general level of education of a population is a key factor on the demand side which would be expected to influence the ease with which any investment in health services will be translated into improved health. Where education and literacy rates are low, there will be a lack of demand for effective health interventions; and they may not be used appropriately at the household level. Female education, in particular, has been shown to be related to child health outcomes, for reasons that are probably related to women's agency, their openness to new health technologies, and their ability to use them effectively. In societies with low education levels, especially of women, simply scaling up effective health

interventions will not guarantee that they are used, or used effectively. To capture the ways in which constraints at the household and community levels operate to restrict the effectiveness of health investment or increase the cost of achieving a given level of outcome, the national level female literacy rate has been included in the constraints measure.

Health services delivery level: A range of variables have been included to capture the extent to which health system-level constraints will influence the scaling up of interventions. These variables are intended to function as proxy measures of the *capacity* of health systems, and not to reflect inputs alone.

The inclusion of vaccination coverage rates, as measured by DPT3 (diphtheria, pertussis and tetanus) coverage under 12 months of age is intended to capture the extent to which the peripheral health system is capable of achieving high coverage. Vaccination rates are a good proxy for the strength of broader health service delivery systems because an effective vaccination programme relies heavily on systems to ensure the constant availability of a broad range of health system inputs at the peripheral level. These include a network of physically accessible health facilities, a management system which ensure that vaccines are available in health facilities, a functioning cold chain to keep the antigens effective, appropriately trained staff, and health information systems which allow for reporting of vaccination coverage. Of course, it is possible to run categorical vaccination programmes for certain vaccines which rely primarily on central-level inputs and planning, but this is unlikely to lead to as high and sustained levels of vaccination coverage (15).

Scaling up health services delivery to peripheral populations requires a cadre of appropriately trained personnel. In addition, this cadre should be deployed in rural areas, and not concentrated in urban health facilities. In most low-income countries, nurses provide the bulk of primary health care services. Where nurses are in short supply, it is unlikely that a

strong network of peripheral health services can be sustained. The number of nurses per 100,000 population has therefore been included in the index to capture the availability of this key input. Ideally we should also measure the distribution of health personnel, and their quality, but appropriate cross-country data are not available.

The physical accessibility of health services is the third variable included to capture the capacity and strength of health service delivery systems and the feasibility of rapidly scaling up interventions. This is measured as the proportion of the population that has access to a health facility. It is intended to capture the level of infrastructure and its distribution in rural areas.

Environmental characteristics level I -- Governance and overall policy framework level:

This is a key contextual factor, exogenous to the health system, which will influence the feasibility of scaling up interventions. In countries where governance is weak, new investment in the health sector is likely to produce lower returns in terms of improved health of poor people or, in other words, a given improvement will be more costly to achieve. A variety of factors are likely to underpin this relationship. First, there are the costs of corruption in public procurement, so that any given quantity of inputs will cost more in an environment characterised by poor governance. Second, there are issues of deployment of incremental resources. It can be argued that in poor-governance contexts, additional inputs are more likely to be diverted to interventions and locations that benefit groups that are more politically powerful than the rural poor. Third, community involvement in health service delivery, and willingness to participate in outreach or community-based programmes designed to extend the reach of fixed health services, are likely to be lower in environments characterised by low levels of trust in public authorities. This is also likely to diminish the motivation of service users to make their views and preferences known, and the effectiveness

of community action. Fourth, institutional capacity, staff performance and motivation, and the overall effectiveness of public action, is likely to be lower where governance is poor. Finally, limited rule of law and enforceability of contracts will limit the potential for contracting for services to be provided by actors outside the public sector.

The measurement of governance at the country level is clearly conceptually and practically challenging. Researchers at the World Bank (16) have produced a dataset containing 6 governance indicators for a broad cross-section of countries, the data for which are publicly available. Governance is defined by the authors as the traditions and institutions by which authority is exercised. It includes three main dimensions:

- The process for selecting, monitoring and replacing governments
- The capacity to formulate and implement sound policies
- The respect of citizens and state for institutions governing economic and social interactions.

Two “clusters” or indices have been constructed for each of these three dimensions, which are themselves aggregated from a number of different indicators. The data on governance used to construct these indices include both polls of experts and cross-country surveys of firm managers or citizens. Some of the data sources are more representative, in the sense that they cover a broader sample of countries, and the aggregation process that is used takes account of differences in country coverage. For the purposes of the present analysis, we have chosen to focus on two key dimensions of governance: government effectiveness and control of corruption.

Government effectiveness combines perceptions of the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil

service from political pressures, and the credibility of the government's commitment to policies.

Control of corruption combines surveys which measure perceptions of corruption, where corruption is defined as the exercise of public power for private gain. The authors note that despite the straightforward definition of corruption, different data sources measure slightly different aspects of corruption, ranging from the frequency of "additional payments to get things done" to the effects of corruption on the business environment (16).

Environmental characteristics level II – Physical environment: A country's geographic characteristics, in particular the extent to which it is tropical, is also hypothesised to influence the feasibility of scaling up interventions.³ We suggest that the influence of geography on scaling up will work through two channels. First, the magnitude and nature of the disease burden is likely to be greater under tropical conditions. Health facilities may be required to offer a greater variety of interventions to address the broad range of tropical diseases, and key health interventions required to address environmental health problems, such as safe water and sanitation facilities, may not be delivered through the health system. While there may be positive externalities from intervening on communicable diseases, increasing the returns to investment, quite high levels of coverage of interventions are required for the externality to be realised. Secondly, being located in the tropics may create greater problems of physical accessibility of services, influencing both the cost of service delivery and the coverage that can be achieved. Both of these features are captured through a variable which measures the proportion of the population located in the geographic tropics.

³ The effects of geography on economic growth have been explored by researchers from the Harvard Center for International Development (17)

c) Which data sources?

For a number of the indicators used in measuring constraints there is more than one possible source of data. For instance, DPT coverage data is produced both by GAVI and by WHO.

There are a variety of possible sources of data on governance, including Transparency International (18). In the case of corruption indices, in particular, it has been noted that there are potentially sample selection problems, in that most available corruption indicators provide ratings only for the larger countries, in which multinational investors have the greatest interest (19). We have chosen to use the World Bank governance indicators because they appear to have considerably higher coverage, and because they are constructed to be inclusive of the data from a variety of other sources. In addition, the aggregation procedure takes country representativeness, which might otherwise bias the figures, into account.

The specific indicators used to measure constraints, the period over which they are measured, and their source are provided in Table 1.

(TABLE 1 ABOUT HERE)

4. Analysis of constraints I: Individual constraint variables

The analysis of individual constraint variables has been undertaken in two stages. First, we have examined the data on the 7 constraint variables individually, through graphical analysis to understand the range and distribution of the variables. Secondly, to provide insights into the types of strategic choices, we have divided each variable into quartiles, and for each country have looked at the levels of the different constraint variables. We have focused on the health systems and governance variables in order to begin to get at the distinction between the constraints that are primarily financial in nature and can be “bought off”, vs. those that are softer and more difficult to relax by merely injecting new resources. This assumes that the health system constraints are primarily financial, and that problems arising from poor governance lie outside the control of the health sector and are not amenable to simple cash solutions. However, we recognise that this is a naïve dichotomy, in that to relax many of the health system constraints requires political commitment in favour of the poor; and that even under circumstances of poor governance, it may be possible to deliver interventions by choosing delivery mechanisms that circumvent the health system.

The criteria we have used in the categorisation are as follows. For “strong” health system, a country must be in the top half of the distribution for at least 2 of the three health system variables (nurses, DPT coverage and access) and for “weak” health system, in the bottom half of the distribution for at least two of the three. For “strong” governance, both variables must be in the top two quartiles, and for “weak” governance, both must be in the lower two quartiles.

Table 2 summarises the data on the individual constraint variables. Appendix 1 presents graphs of the individual constraint variables separately for low and lower-middle income countries, together with country typologies by quartile for each variable.

(TABLE 2 ABOUT HERE)

Tables 3 and 4 classify countries by the strength of their health system and their governance indicators. Such a categorisation will obviously be imprecise and subjective, and will also be subject to problems of missing data. In addition, for many countries, the pattern across variables is unclear. For example, Angola appears to have a relatively large number of nurses, but very low DPT coverage, no doubt reflecting the effect of the conflict outside the main urban centres. Similarly, Sudan, Nigeria, Algeria, Iraq and Syria are well-endowed with nurses and report fairly high access to health services, yet have DPT coverage below average for the sample. This may reflect problems of the distribution of resources within a country, together with organisational and logistics capacity, all of which are reflected in the poor governance indicators. Within the set of governance indicators a number of countries have heterogeneous performance, for example, with relatively low levels of corruption but also low government effectiveness. Where a country exhibits a pattern across the governance variables which is unclear in this way we have not categorised it. Another problem is the fact that some of the data, especially on governance indicators, are now out of date. For instance, the data for both corruption and government effectiveness for Sierra Leone suggest that it is

in the top performing quartile. Despite these conceptual and data limitations, we believe this to be a useful way to apply the overall conceptual framework and open the debate on strategic choices for scaling up.

(TABLE 3 ABOUT HERE)

(TABLE 4 ABOUT HERE)

5. Analysis of constraints II: Constraints index

In addition to the analysis of individual variables, we have created an overall index of constraints. To avoid some of the controversies which sometimes arise in the construction of “performance indicators”, we have endeavoured in constructing this index to take as simple and transparent an approach as possible. This applies both to the process of aggregation and to the treatment of missing data.

Because of the ongoing discussions about the focus on poor countries versus poor people, and for consistency with the costing group, we have constructed the index separately for low-income (n=63) and for lower-middle income (n=53) countries, and present the results separately.⁴

To aggregate across the variables, which have different ranges, we have first scaled them to a 0-100 interval. The index is formed by taking the simple sum of the scaled levels of each of the variables. This implies that equal weights are attached to each variable.

Many countries do not have a full set of data for each of the 8 indicators in the index (see Table 5). In undertaking the analysis we have adopted three different approaches to treatment of missing data. First, we have constructed the index for only those countries for which observations are available for all of the 7 indicators. This gives a constraints index for rather a restricted set of 26 low-income and 21 lower-middle income countries. Furthermore, this set of countries is likely to be relatively biased towards the least-constrained countries, since non-availability of data will be correlated with greater constraints.

⁴ The country classification in the 2000 World Development Indicators was used. Subsequently, China has been reclassified as a lower-middle income country. However, it is treated as a low-income country in the analysis presented here.

Second, we have imputed a “neutral” value of 50 (on the scale of 0-100) for missing data. We have then constructed the index varying the tolerance for missing values, so that separate classifications are available when up to 1 missing value is tolerated for each country, up to 2 missing values, and up to 3 missing values. This allows the sample to be increased and to some degree reduces the bias resulting from missing data, but does not eliminate it altogether. Finally, we have assumed that the extent of missing data on key variables is likely to be correlated with a country’s constraint level: in other words, countries which are missing data are more likely to be more highly constrained. We therefore impute a “low” value of 25 for missing data. We then follow the procedure above of varying the tolerance for missing data, and create separate classifications. These are the results presented in the typology below, and represent the “baseline” case for the index. However, sensitivity analysis has been undertaken to examine how the classifications vary depending on whether missing values are imputed a “neutral” or “low” value.

(TABLE 5 ABOUT HERE)

The index is a continuous variable, which can range from 0 (most constrained) to a maximum value of 800 (least constrained). It is therefore possible to look at the absolute level of the index for a country, use country rankings, or divide countries into groups with relatively similar levels of constraints. Given that the margins of error around a number of the variables in the index are known to be wide (e.g. the governance indicators – (18)) and the number of countries with missing data for one or more indicators, the most conservative approach would appear to be the most appealing. This involves looking at country groupings rather than absolute levels or rankings.

For the present purposes, countries have been divided into quartiles. However, we have also plotted the cumulative distributions of the index in order to investigate the extent to which there are important non-linearities and more logical cutoff points (see Appendix 2).

(TABLE 6 ABOUT HERE)

(TABLE 7 ABOUT HERE)

(TABLE 8 ABOUT HERE)

(TABLE 9 ABOUT HERE)

6. Sensitivity analysis

Sensitivity analysis has been undertaken by computing the quartile grouping under different assumptions, and cross-tabulating these against the baseline quartile categorisation to see how much movement there is in the country typology when different assumptions are made.

The following variations have been examined:

- Differences in data source (WHO vs. GAVI data on DPT3 coverage)
- Including or excluding income from index
- Treatment of missing data: Imputed values for missing data (25/100 vs. 50/100)
- Treatment of missing data: Tolerance for number of missing indicators
- Including or excluding the governance indicators from index
- Using DOTs coverage vs. DPT coverage as health service indicator

No standard exists against which the sensitivity of the country classification can be compared, so our assessment is tentative. Appendix 3 describes in greater detail how the sensitivity analysis was undertaken and presents a summary of the results.

Of the assumptions tested, the quartile classification is most sensitive to the exclusion of the governance indicators, where the proportion of countries which shift quartiles ranges from 25-40% for low income countries, and 40-50% for lower-middle income countries. In the vast majority of cases, the shift is only from one quartile to the next, though there are a small number of instances in which countries jump by more than 1 quartile when the governance

indicators are excluded. The results are also fairly sensitive to data source for DPT coverage, with about 20% of low income countries and 30% of lower-middle income countries shifting position. Exclusion of income from the index makes relatively little difference, as does imputing missing values at the median rather than 25th percentile. In general, the classification of lower-middle income countries is more sensitive to the assumptions tested than is the classification of low-income countries.

7. Other indicators of constraints

Discussions within the WG5 team have identified a number of other variables that could be included in the index to capture constraints at different levels, but for which either the interpretation or the availability/validity of the data are not so clear that the variables merit direct inclusion in the index at this stage. Nonetheless, it was felt that there is considerable descriptive value of these data, and they also provide an additional lens through which to consider the face validity of the constraints index (see Section 8).

a) The relationship between access to health services and the availability of doctors

This variable is intended to capture a measure of commitment to the distribution of key inputs such as medical staff. This can be considered a health sector policy level variable. Countries have been divided into four groupings, according to whether they fall in the bottom or top 50% of the distribution along the two variables (Tables 10 and 11). The interest is in the countries falling off the diagonal. Where the availability of doctors is relatively low, but access high, the countries can be considered to be committed to improving access to health services even within resource constraints. Where there are relatively more doctors, yet access remains low, countries can be considered to demonstrate relatively low commitment to such distributional issues.

(TABLE 10 ABOUT HERE)

(TABLE 11 ABOUT HERE)

b) Government commitment to public health expenditure

In Section 3 it was argued that the deployment of new resources in favour of improving health outcomes of the poor would depend critically on characteristics of the overall political environment, including a government's commitment to the social sectors in general, and to equity in the distribution of these resources. In order to explore variations among countries in political commitment, we have constructed an index of government commitment to the health sector.

Definition of commitment: A minimal notion of commitment to the health sector has been adopted for presentation here, which examines government responses in two different states of the world. "Good times" are defined as conditions where real GDP is rising; and "bad times" where it is falling. Commitment is measured in relation to the level of public health expenditure in the base year (1990). The level of per capita government health expenditure, measured in constant 1995 US dollars is represented by $H(90)$.

In bad times, a government is considered to be committed if the absolute level of public expenditure per capita does not fall below the baseline expenditure level, i.e. if $H(t) \geq H(90)$.

In good times, a government is considered to be committed if the share of health expenditure in GDP is expanded beyond the share in the baseline year, i.e. if $H(t) \geq \alpha Y(t)$, where $\alpha =$ the share of health in GDP in the baseline year ($= H(90)/Y(90)$).

Following this approach, an measure of commitment in a particular year can be calculated as:

$$C = H(t) - \max\{H(90), \alpha Y(t)\}.$$

This measure takes a positive value if in a “bad year”, the level of health expenditure is greater than the baseline year (in other words, if the government has managed to protect health expenditure levels), or if the level of expenditure represents at least the same share of (a higher level of) real income in a good year (i.e. the health *share* is not allowed to decline).

The measure takes a negative value if the level of health expenditure in a “bad year” falls below the baseline level, or if health expenditure is a smaller share of income than in the baseline year, even though the level may be higher.

In order to smooth out patterns over time, the average of C is taken over the period 1991 to 1998 (the most recent year for which health expenditure data are available in the World Development Indicators). A positive average value of C over this period can be interpreted as government protection of health expenditure over time; a negative average value suggests that government has not protected/promoted health expenditure. The mean value of C is calculated over all the years for which data are available (i.e. missing years, other than 1990, are tolerated).

Tables 12 and 13 below show countries for which the average value of C over the period 1991-1998 is positive and negative. The index has been calculated separately for low and lower-middle income countries.

(TABLE 12 ABOUT HERE)

(TABLE 13 ABOUT HERE)

There are a number of weaknesses in this measure of commitment. In particular, our characterisation of commitment as expanding the role of the public sector in “good times” is debatable. The need for health expenditure may be lower in good times due to improved nutrition and living conditions; and at the same time, people’s ability to pay for their own health care may be enhanced either because of higher earnings, or higher levels of employment-related health insurance. It would therefore be possible, it is argued, for government to reduce spending in good times.⁵ Other important limitations of the commitment measure are discussed in Appendix 4.

8. Relationship between constraints and health outcomes

If the constraints index is effectively capturing the construct that we are trying to measure, there should be a relationship with health outcomes, in the sense that more constrained health systems should produce lower health achievements. This would be an indication of the face validity of the index. By analysing this relationship between constraints and health outcomes we are not arguing that the health system is the main influence on health status, but simply that part of the variation across countries in health status should be explained by health system constraints.

This leaves the choice of which health outcomes to measure, and over which period of time. The variables measuring different constraints are measured at different points in time over the period 1985 to 1999. The constraints index should therefore be considered to measure the *average* level of constraints that operated in a specific country over that time period. The

analysis of the relationship with health outcomes should therefore, to the degree possible, apply to the same time period. The health outcome measures we have chosen to examine are under-five mortality and adult mortality. The data for these variables available in the World Development Indicators cover the largest number of countries for 1990 and 1997. In addition to the levels of health achievement, measured as the level of mortality in 1990 and 1997, we can hypothesise a relationship between the level of constraints operating and the improvements in health outcomes over that period. To investigate this relationship we have looked at the relationship between the level of the constraints index and the simple change in mortality rate (mortality rate in 1990 - mortality rate in 1997), and at the proportionate change ($= \frac{\text{mortality rate in 1990} - \text{mortality rate in 1997}}{\text{mortality rate in 1990}}$). We hypothesise that countries facing fewer constraints (i.e. a higher value of the constraints index) should be able to achieve a greater reduction in mortality, and therefore expect the coefficient on the constraint variable to be positive.

Summary health outcome statistics for the sample of countries for which constraints data are available are shown in Table 14. The results of simple ordinary least squares regression of the relationship between health outcomes and the constraints index are shown in Tables 15 and 16.

(TABLE 14 ABOUT HERE)

⁵ We are grateful to an anonymous reviewer for pointing this out. Future versions of this analysis will revise the government commitment measure.

(TABLE 15 ABOUT HERE)

The regression results for low-income countries show a consistently strong and statistically significant relationship between mortality levels and the constraints index for all three mortality measures. As judged by the size of the regression coefficients, the relationship is somewhat stronger in 1990 than in 1997. The results are fairly consistent across the different variants of the index which include larger numbers of missing values.

In contrast with the mortality *level* variables, there is no apparent correlation between the constraints index and *changes* in mortality (controlling for the level in 1990) over the period 1990 and 1997 for low-income countries. In other words, there is no evidence to suggest that less-constrained countries achieved greater improvements in health outcomes over the period. This may be because of the short time period considered. The coefficients are, nonetheless, of the expected sign, with a higher value of the index (less constrained) associated with a greater improvement in mortality.

(TABLE 16 ABOUT HERE)

In comparison with the results for low income countries, the lower-middle income countries show fewer significant coefficients, and the magnitude of the coefficients is much smaller. The expected relationship holds between the level of the constraint index and the level of mortality for under-fives and adult females, but there is no significant association with the level of adult male mortality. Somewhat counter-intuitively, higher constraint levels appear to be associated with greater declines in mortality over the 1990-97 period, even after controlling for the level of mortality, though many of these coefficients are not statistically significant. One explanation for the smaller coefficients may be that the types of constraints measured in the index are less critical in influencing health outcomes in middle-income countries. As income increases and the share of deaths from communicable diseases falls, the contribution of health systems to improved health outcomes may diminish, and the types of constraints measured here may become less important.

In general, therefore, the evidence is broadly in line with hypothesised relationships, though there are some unexpected relationships. It also appears that the inclusion of imputed values for missing data does not materially alter the results of the regression analysis.

9. Discussion

The analysis presented above has aimed at conceptualising and measuring some of the constraints to scaling up interventions to improve the health of the poor. In undertaking this analysis we have attempted to achieve an appropriate balance between an ambitious use of cross-country data to clarify key relationships, and recognising the intrinsic limitations of such a cross-sectional, macro level approach.

Section 2 has already discussed how this analysis could be used to inform some of the strategic choices about delivering interventions. There are two additional areas where this work can help to inform the Working Group's deliberations.

First, there is an important linkage between the conceptualisation and measurement of constraints, and the costing of the intervention package. At least 3 different implications of constraints for costing can be envisaged:

- In more-constrained countries, costs may be higher because more inputs are needed, for example, to overcome problems of access.
- In more-constrained countries, additional investment in “soft” interventions may be required to relax constraints and make it possible to work through the health system. These could take the form of measures targeted at peripheral health systems, or might involve broader programmes of health sector reform.
- In more-constrained countries, different delivery mechanisms (as discussed above) might be required to scale up investments. This might be thought of as choosing an alternative technology. The consequences for costs are likely to be mixed: it is entirely possible that certain forms of partnership with the private sector may achieve greater coverage at lower cost than working through the public sector alone.

Discussion of exactly how WG5 will be able to use the results of this type of analysis is still underway. This will certainly involve consideration of specific delivery mechanisms for specific interventions, and the likely implications for costs and coverage.

A second use of the constraints typology may be to choose which countries to focus on first. There are some arguments in favour of working first in low-constraint countries, or at least those where governance constraints are not binding, so as to achieve initially higher returns to investment. These advantages include the potential to demonstrate success and to convince the international audience that success is possible. There may also be some lessons from early implementation that can be applied elsewhere.

There are, however, also a number of disadvantages of this sequencing approach. The first is that there may in fact be very limited opportunities to “learn by doing”, in the sense that

conditions are so different in more-constrained contexts that very different strategies are needed. The second involves the equity consequences of “picking the low-lying fruit”. We have seen above (Section 8) that there is a strongly negative relationship between the level of constraints and health outcomes, with much worse health status in the most-constrained countries. Any efforts to maximise the efficiency of such investments must also consider the broader aim of such an effort which is to improve the health of the poor. A selective strategy of sequencing country activities will have to be based on more careful analysis of the trade-offs which exist between equity and efficiency, and could be supported through better evidence of the concentration of poor populations in high-constraint countries.

There are a number of limitations to this work. First, there are the limitations of the overall approach, which operates at a macro, cross-sectional level. It is possible through such analysis to begin to identify those countries which are more or less constrained, and, to the extent that the data are credible and are able to measure the appropriate constraints, to consider how the constraints might shape the choice of delivery strategy. However, the cross-sectional approach is not able to clarify the types of action needed to improve a highly-constrained country’s performance to the level of a less constrained one. In order to understand the causal relationships between policies and outcomes a temporal dimension is required. Unfortunately, most of the key health policy data are not available over time, and the evidence about the effectiveness of specific strategies remains elusive. The two related pieces of work being undertaken on constraints (the systematic review of interventions to strengthen peripheral health systems, and the country case studies of efforts to relax constraints) will contribute to this evidence; however, this is likely to remain a key knowledge gap.

A second limitation is given by the lack of data. There are a large number of constructs from the conceptual framework in Section 2 that cannot be measured for enough countries to allow

this type of analysis to be undertaken. This is particularly true for variables relating to the demand side, and those describing the incentives and institutions embodied in different health systems. In addition to the sheer lack of data, the data for a number of variables is out-of-date. This is true of both the health systems variables (e.g. the supply of nurses is measured over the period 1989-1999) and the governance variables, where a number of anomalies are apparent. Finally, most of the data reflect national averages, not distributions, so that important within-country inequalities are masked.

A third problem is one created by the “ecological fallacy”. Comparing between countries, we have found significant associations between the constraints index and mortality (both under-five and adult). If a similar analysis were carried out comparing between smaller units – perhaps comparing between states/provinces – the correlation between constraints and mortality could be different. Finding different correlation coefficients at different levels of analysis (the ecological fallacy) occurs for two main reasons (20). Firstly, when performing an “inter-state” analysis, it might be possible to identify and control for potentially confounding variables that could not be included in the “inter-country” analysis. For example, we might have good aggregate data on systems for the supply and distribution of drugs at the state level. If this information were incorporated into the constraints index, or included in the model as a potential confounder, this could impact on association (strength or significance) between the constraints index and mortality. Secondly, an aggregate variable at the country-level may not have an equivalent, or may be interpreted differently, at sub-country levels. For example, the corruption and government effectiveness measures included in our analysis are based on government functions that may have no equivalent at the state level. The importance of ecological fallacy (and thus the robustness of our analysis) could be tested by duplicating the analysis within regions or countries.

A fourth concern is that we have only been partially successful in our efforts to clarify which constraints can be “bought off” with additional cash versus those softer constraints which are more difficult to buy off. The classification of countries by the strength of their health system and the strength of their governance in Section 4 is only partially able to get at this distinction. Many health system constraints cannot be easily bought off; and even where a country has very weak governance, it may be possible to deliver interventions successfully by choosing an appropriate delivery mechanism.

A final issue is raised by our focus on health systems. Solutions to many of the key health problems in low income countries lie not in traditional facility-based health interventions, but in community-based and environmental interventions, which are not examined explicitly in this paper.

4. Conclusions

The above limitations notwithstanding, it is clear from the above analysis and discussion that poor countries are a highly heterogeneous group, with differing levels of constraints, and of types of constraints. We have argued that it will be critical to take these variations among countries into account when considering how best to scale up interventions, as well as in thinking about the costs of scaling up.

While it is undoubtedly true that absolute resource shortages are responsible for the failure of many governments to deliver adequate health services to their populations, non-financial constraints are also critical. These cannot be bought off in the short-to-medium term – yet will have a dramatic impact on the outcomes of efforts to scale up interventions. These non-financial constraints may include the need to develop inputs that lie outside the control of the health sector (such as infrastructure or transport systems); that require long lead times to develop (such as increasing demand for effective interventions through improving female education levels); or dimensions of the socio-political environment that are not amenable to

external manipulation or are subject to uncertain time horizons for significant change (such as governance issues). The aim of this paper has been to begin to characterise some of these non-financial constraints, to quantify them, and to begin to conceptualise how they can be overcome in the short-to-medium term. This analysis can be used to guide discussions about how to deliver priority interventions, as well as to inform discussions of the resource requirements for such a concerted effort to improve the health outcomes of the poor.

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I. Community and household level

Constraint	Element of production function: Availability of inputs (X/Z), Technology (T), Sociopolitical (S), Or demand function (adapted from Barnum)	Amenability to buy-out in the short term (Preliminary assessment)	Comments about time frame; interactions between X/Z, T and S; issues of sectoral control
Lack of demand for effective interventions, due to: Lack of appropriate information about symptoms, appropriate responses, characteristics of interventions; Low levels of education, especially of women	X (Input into demand)	*** (Information) * (Education)	Investments in education will require a longer time frame and political commitment, so there is an interaction between X and S; Outside the control of the health sector
Barriers to use of effective interventions:			
Physical (distance)	X (availability of health infrastructure; issues of transport networks)	*** (Investments in health infrastructure) *** (Investments in transport infrastructure) <i>[question of whether these can be bought off in the short term or if requires medium-term framework]</i>	Pro-poor investments in infrastructure will require political commitment, suggesting interaction between X and S; Decisions about transport infrastructure outside control of health sector
Financial (user fees + costs of travel, time, lack of risk-sharing)	T (Policy)	***	Policy framework would have to favour elimination of user fees.
Gender, cultural, social (e.g. women's decision making authority within the household; cultural differences, organising marginalised groups)	S	*	Change in social attitudes likely to be a long-term process. Outside control of health sector

*** Highly amenable to buy-out

** Moderately/partially amenable to buy-out

* Non-financial dimension of constraint is binding

II. Health services delivery level

Constraint	Element of production function: Availability of inputs (X/Z), Technology (T), Sociopolitical (S), Or demand function (adapted from Barnum)	Amenability to buy-out in the short term (Preliminary assessment)	Comments about time frame; interactions between X/Z, T and S; issues of sectoral control
Shortage and distribution of appropriately qualified staff	Z T	** (staff payment issues) ** (shortage of adequately trained staff) *(distribution)	Issues around staff payment raise broader civil service concerns therefore not only financial; Lead time to training more staff: longer for basic training to increase cadre than for in-service training to update skills ; Resolving issues of distribution of staff will require political commitment to improving access.
Weak technical guidance, programme management and supervision	X T	*** Technical guidance could be improved with additional resources such as training of staff and development of supervision tools ** / * Programme management and supervision	Could improve technical guidance in the short term. Resources and incentives are clearly a constraint to adequate supervision, but also involves improvements to feedback and reward systems which are harder to improve (Oliveira-Cruz et al. 2001).
Inadequate supplies of drugs and medical supplies	X T	*** Additional resources for drugs ** Improved systems for procurement and supplying drugs	
Lack of equipment and infrastructure, poor accessibility of health services	Z T (appropriate equipment) S	*** Equipment * Appropriateness and distribution of equipment	Note that issues of choice of appropriate technology and distribution of commitment are related to political commitment (s/t)

*** Highly amenable to buy-out

** Moderately/partially amenable to buy-out

* Non-financial dimension of constraint is binding

III. Health sector policy and strategic management level

Constraint	Element of production function: Availability of inputs (X/Z), Technology (T), Sociopolitical (S), Or demand function (adapted from Barnum)	Amenability to buy-out in the short term (Preliminary assessment)	Comments about time frame; interactions between X/Z, T and S; issues of sectoral control
Weak and overly centralised systems for planning and management	T	**	Effectiveness and sustainability of “soft” interventions tend to be dependent on political commitment to change, together with incentives; therefore may interact with S as well.
Weak drug policies and supply system	T	*	Ditto.
Inadequate regulation of pharmaceutical and private sectors	T/S	**	Resource constraints are an important cause of ineffective regulatory systems; but again, political commitment will influence the effectiveness of any incremental resources. Corruption and vested interests also play a role, suggesting interaction between T and S.
Lack of intersectoral action and partnership for health between government and civil society	T S	*	
Weak incentives to use inputs efficiently and respond to user needs and preferences	T	**	Incentives modelled as part of technology. Includes element of salaries, which relates directly to inputs (e.g. the cost of raising salaries sufficiently to elicit greater effort); also pertains to systems to identify and reward good performance which may be fied in the culture of the public service; may also create problems across sectors (see cross-cutting policies) and regionally if higher salaries in one country prompt an exodus of trained personnel from others. Also includes broader institutions, such as linkages between budgets and output; this raises cross-sectoral issues also, such as retention of revenue.
Reliance on donor funding which reduces flexibility and ownership	T	*	Cannot be “bought out”

- *** Highly amenable to buy-out
- ** Moderately/partially amenable to buy-out
- * Non-financial dimension of constraint is binding

IV. Public policies cutting across sectors

Constraint	Element of production function: Availability of inputs (X/Z), Technology (T), Sociopolitical (S), Or demand function (adapted from Barnum)	Amenability to buy-out in the short term (Preliminary assessment)	Comments about time frame; interactions between X/Z, T and S; issues of sectoral control
Government bureaucracy (civil service rules and remuneration; centralised management system; civil service reforms)	T/S	** (levels of remuneration) * (reforms required)	Whether these belong to the mutable or immutable parts of technology will depend on broader political environment; Key responsibilities lie outside health sector
Poor availability of communication and transport infrastructure	Z	*** (investment in infrastructure)	Effectiveness of investment in improving access for poor people will vary with S Key responsibilities lie outside health sector

*** Highly amenable to buy-out

** Moderately/partially amenable to buy-out

* Non-financial dimension of constraint is binding

V. Environmental characteristics

Constraint	Element of production function: Availability of inputs (X/Z), Technology (T), Sociopolitical (S), Or demand function (adapted from Barnum)	Amenability to buy-out in the short term (Preliminary assessment)	Comments about time frame; interactions between X/Z, T and S; issues of sectoral control
<i>A. Governance and overall policy framework</i>			
Corruption, weak government, weak rule of law and enforceability of contracts	S	*	Key responsibilities lie outside health sector
Political instability and insecurity	S	*	Key responsibilities lie outside health sector
Low priority attached to social sectors	S	*	Key responsibilities lie outside health sector
Weak structure for public accountability and opportunities for public opinions to be voiced	S	*	Key responsibilities lie outside health sector
Lack of free press	S	*	Key responsibilities lie outside health sector
<i>B. Physical environment</i>			
Climatic and geographic predisposition to predominance of tropical disease in disease burden	Demand-related, increases requirements for inputs	*	Not subject to change through policy
Physical environment unfavourable to service delivery	Increases requirements for inputs	*	Not subject to change through policy

*** Highly amenable to buy-out

** Moderately/partially amenable to buy-out

* Non-financial dimension of constraint is binding

Table 1. Variables used to measure constraints

Level	Variable	Indicator	Year	Source
I. Community/ Household	Lack of demand for effective interventions due to lack of information and low levels of education	Female literacy	1998	HDR2000
II. Health services delivery	Shortage and maldistribution of appropriately qualified staff	Nurses/100,000 population	1989-99	WHOSYS
	Weak systems for managing supplies, staff, information	DPT3 coverage	1998	WHO (website)
	Lack of equipment and infrastructure, poor accessibility of health services	Access to health services	1985-95	UNICEF 1996 (website)
3. Health sector policy		NONE		
4. Cross-sectoral policy		NONE		
5. Environmental characteristics	Corruption, weak government, weak rule of law and enforceability of contracts	Control of corruption	1999	World Bank (Kaufmann et al.)

Level	Variable	Indicator	Year	Source
	Weak structures of public accountability and government effectiveness	Government effectiveness	1999	World Bank (Kaufmann et al.)
	Geographic constraints	Proportion of the population in the geographic tropics	N/a	Harvard Centre for International Development (http://www2.cid.harvard.edu/ciddata/geographydata.htm , accessed 4 May 2001)

Table 2: Summary statistics, individual constraints

	Low income		Lower-middle income	
	Mean (S.d.)	Range	Mean (S.d)	Range
Literacy	51.4 (24.8)	7.4-98.6	79.9 (18.1)	34 – 99.8
Nurses/100,000	123.3 (198.4)	5-874	300.0(282.3)	23.9 – 1182
DPT coverage	65.9 (23.5)	18-99	88.2 (13.6)	23 – 100
Access to health services	60.4 (21.7)	18-95	79.5 (17.9)	34 – 99
Control of corruption	-0.63 (0.40)	-1.57 - 0.19	-0.36 (0.49)	-1.27 – 0.81
Government effectiveness	-0.61 (0.51)	-1.8 - 0.16	-0.39 (0.56)	-1.88 – 0.64
GDP per capita	1370.8 (622.1)	458-3105*	4262.0 (1326)	2053 – 8488
Proportion of population in tropics	75.5 (41.7)	0-100	45.4 (49.9)	0-100

*GDP per capita for China.

Table 3: Country classification by individual constraints, Low income countries

	Health system:	
Governance:	Strong	Weak
Strong	China The Gambia India Kenya Lesotho Moldova Mongolia Vietnam	Burkina Faso Cote d'Ivoire Ethiopia Ghana Madagascar Mali Senegal Sierra Leone Togo Uganda
Weak	Congo, Brazzaville Kyrgyz Republic Nicaragua Nigeria Sudan Tajikistan Turkmenistan	Cameroon Chad Congo, Dem Rep Indonesia Liberia Myanmar Niger Pakistan Somalia Yemen

Table 4: Country classification by individual constraints, Lower-middle income countries

	Health system:
--	----------------

Governance:	Strong	Weak
Strong	Egypt Jordan Latvia Lithuania Tunisia	Costa Rica Guyana Morocco Namibia Peru Philippines Suriname
Weak	Algeria Belarus Bulgaria Iraq Kazakstan Russian Federation Syria Ukraine Uzbekistan	Dominican Republic Ecuador Papua New Guinea Paraguay

Table 5: Number of countries for which data are missing for different indicators in the index

	Low income countries	Lower-middle income countries
Female literacy	17	10
Nurses/100,000 population	5	3
DPT3 coverage	7	6
Access to health services	12	29
Control of corruption	14	10
Government effectiveness	12	9
GDP per capita (PPP-adjusted)	7	8
% Population in the geographic tropics	3	9
Total number of countries	63	53

Table 6: Mean value of constraints index, low income countries

	N	Mean (std. Dev)
No missing values	21	332.3 (123.4)
Up to 1 missing value	33	340.2 (124.3)
Up to 2 missing values	38	333.6 (130.9)
Up to 3 missing values	43	325.1 (126.1)

Table 7: Mean value of constraints index, lower-middle income countries

	N	Mean (std. dev)
No missing values	21	396.0 (87.5)

Up to 1 missing value	33	426.9 (95.4)
Up to 2 missing values	38	425.1 (89.4)
Up to 3 missing values	43	414.6 (89.3)

Table 8. Country Typology by constraint level, Low income countries, quartiles

Quartile	0 missing values	Up to 1 missing	Up to 2 missing	Up to 3 missing
Q1 (most constrained)	Mali Sudan Benin Haiti Congo, Dem. Rep Niger Nigeria	Yemen, Rep. Sudan Nigeria Central African Rep Chad Niger Haiti Benin Guinea-Bissau Congo, Dem. Rep Mali	Haiti Nigeria Somalia Guinea-Bissau Lao PDR Niger Congo, Dem. Rep Central African Rep Angola Chad Yemen, Rep. Sudan Liberia	Haiti Cambodia Eritrea Congo, Dem. Rep Yemen, Rep. Mauritania Angola Guinea-Bissau Central African Rep Liberia Burundi Nigeria Niger Chad Somalia

Quartile	0 missing values	Up to 1 missing	Up to 2 missing	Up to 3 missing
Q2	Togo Cameroon Tanzania Uganda Cote d'Ivoire Senegal	Mozambique Zambia Myanmar Togo Ethiopia Burkina Faso Senegal Cote d'Ivoire Cameroon Uganda Sierra Leone	Mali Senegal Sierra Leone Benin Myanmar Cameroon Burkina Faso Zambia Ethiopia Mozambique Uganda Togo	Uganda Mali Cameroon Senegal Togo Lao PDR Nepal Burkina Faso Myanmar Ethiopia Sudan Sierra Leone Benin Mozambique
Q3	Honduras Madagascar Indonesia Bangladesh Kenya Nicaragua Pakistan Ghana	Guinea Honduras Indonesia Tanzania Pakistan Congo, Rep. Malawi Kenya Madagascar Bangladesh Nicaragua Ghana	Bangladesh Malawi Honduras Indonesia Congo, Rep. Ghana Tanzania Kenya Madagascar Guinea Pakistan Nicaragua Cote d'Ivoire	Bangladesh Turkmenistan Tanzania Congo, Rep. Cote d'Ivoire Kenya Guinea Pakistan Zambia Honduras Madagascar Malawi Bhutan

Quartile	0 missing values	Up to 1 missing	Up to 2 missing	Up to 3 missing
				Ghana Korea, Dem. Re
Q4 (least constrained)	India Gambia, The China Zimbabwe Vietnam	India Zimbabwe Armenia Gambia, The China Moldova Mongolia Tajikistan Vietnam Lesotho	India Lesotho Gambia, The China Tajikistan Kyrgyz Repi Vietnam Azerbaijan Mongolia Armenia Zimbabwe Moldova	India Nicaragua Lesotho Zimbabwe Moldova Armenia Indonesia Azerbaijan Vietnam China Kyrgyz Rep Tajikistan Gambia, The Mongolia

Table 9. Country Typology by constraint level, Lower-middle income countries, quartiles

Quartile	0 missing values	Up to 1 missing	Up to 2 missing	Up to 3 missing
Q1 (most constrained)	Bolivia Guatemala El Salvador Ecuador Papua New Guinea Dominican Rep	Guyana Guatemala Colombia Dominican Rep Bolivia El Salvador Iraq Papua New Guinea Ecuador	Papua New Guinea Guatemala Colombia Ecuador Iraq Guyana El Salvador Georgia Dominican Rep Bolivia	Belize Suriname Iraq Papua New Guinea Colombia Bolivia Ecuador Dominican Rep Macedonia, FYR Guatemala El Salvador
Q2	Sri Lanka Syrian Arab Rep Paraguay Jamaica Colombia	Peru Thailand Namibia Jamaica Paraguay Syrian Arab Rep Sri Lanka Algeria	Sri Lanka Paraguay Kazakstan Peru Albania Thailand Namibia Syrian Arab Rep Jamaica	Namibia Kazakstan Syrian Arab Rep Georgia Thailand Sri Lanka Jamaica Guyana Bosnia and Herzegovina

Quartile	0 missing values	Up to 1 missing	Up to 2 missing	Up to 3 missing
				Albania Paraguay
Q3	Morocco Algeria Namibia Peru Philippines	Philippines Iran, Islamic Uzbekistan Bulgaria Morocco Ukraine Costa Rica Egypt, Arab Rep	Ukraine Swaziland Algeria Romania Bulgaria Philippines Egypt, Arab Rep Morocco Iran, Islamic Uzbekistan	Iran, Islamic Morocco Uzbekistan Ukraine Peru Egypt, Arab Rep Swaziland Philippines Fiji Romania Algeria
Q4 (least constrained)	Costa Rica Iran, Islamic Egypt, Arab Rep Jordan Tunisia	Tunisia Russian Fed Lithuania South Africa Jordan Latvia Belarus Cuba	Jordan Lithuania Costa Rica Belarus South Africa Tunisia Latvia Cuba Russian Fed	Tunisia Costa Rica Jordan South Africa Russian Fed Cuba Belarus Lithuania Bulgaria Latvia

Table 10: Relationship between supply of doctors and access to health facilities, low income countries

Doctors per 100,000 population	% of population with access to health facilities	
	Low (bottom 50%)	High (top 50%)
Low (bottom 50%)	Benin Congo (Brazzaville) Somalia Afghanistan Chad Mali Angola Cote d'Ivoire Niger Sierra Leone Liberia Senegal Central African Rep. Haiti Ghana Togo	Madagascar Sudan Cameroon Zambia Kenya Guinea Lesotho Tanzania Burkina Faso The Gambia
High (top 50%)	Yemen Guinea-Bissau Bangladesh Cambodia Pakistan Myanmar Mauritania	Honduras Bhutan Nigeria Laos Indonesia DRC Nicaragua Zimbabwe

	% of population with access to health facilities	
Doctors per 100,000 population	Low (bottom 50%)	High (top 50%)
		India Vietnam China Mongolia

Note: Data on doctors/100,000 population are from WHO; for access to health services are from UNICEF.

Table 11: Relationship between supply of doctors and access to health facilities, lower-middle income countries

Doctors per 100,000 population	% of population with access to health facilities	
	Low (bottom 50%)	High (top 50%)
Low (bottom 50%)	Guatemala El Salvador Namibia Morocco Peru Iran	Thailand Tunisia Iraq Sri Lanka Papua New Guinea Algeria
High (top 50%)	Colombia Paraguay Bolivia Philippines Costa Rica Dominican Republic	Ecuador Jamaica Syria Jordan Cuba Egypt

Note: Data on doctors/100,000 population are from WHO; for access to health services are from UNICEF.

Table 12: Government commitment to the health sector, 1991-98, Low income countries

Low commitment	Higher commitment
Moldova	Benin
Kyrgyz Republic	Guinea
Turkmenistan	Yemen
Azerbaijan	Solomon Islands
Mongolia	Ethiopia
Tajikistan	Burkina Faso
Zambia	Indonesia
Senegal	Ghana
Honduras	Kenya
India	Bangladesh
Cameroon	Bhutan
Mozambique	Lesotho
Togo	Lao PDR
Nigeria	Congo, Rep.
Rwanda	Nicaragua
Haiti	Angola
China	
Pakistan	
Vietnam	
Cote d'Ivoire	
Comoros	
Mali	
Tanzania	
Burundi	
Guinea-Bissau	
Nepal	

The index cannot be constructed for the following countries because data on health expenditure in the baseline year are missing: Cambodia, Congo Dem. Rep, Eritrea, Madagascar, Sierra Leone, Niger, Chad, CAR, Malawi, Uganda, Mauritania, Gambia, Zimbabwe, Sao Tome and Principe, Armenia, Afghanistan, Korea DR, Liberia, Myanmar, Somalia, Sudan.

Table 13: Government commitment to the health sector, 1991-98, Lower-middle income countries

Low commitment, 1991-98	Higher commitment, 1991-98
Georgia	Namibia
Kazakstan	Algeria
Uzbekistan	Romania
Iran	Dominican Republic
Bulgaria	Bolivia
Ukraine	Samoa
Albania	Guatemala
South Africa	Maldives
Suriname	Equatorial Guinea
Vanuatu	Costa Rica
Papua New Guinea	Morocco
Jamaica	Guyana
Russian Federation	Swaziland
Jordan	Thailand
Egypt	Ecuador
Sri Lanka	Belize
Philippines	El Salvador
Tunisia	Fiji
	Lithuania
	Paraguay
	Latvia
	Belarus
	Peru

The index cannot be constructed for the following countries because data on health expenditure in the baseline year are missing: St. Vincent and the Grenadines, Kiribati, Dominica, Cape Verde, West Bank and Gaza, Macedonia, Bosnia and Herzegovina, Cuba, Djibouti, Iraq, Marshall Islands, Micronesia, Syria, Tonga and Yugoslavia.

Table 14: Health outcomes: Summary statistics

	Low income: Mean (std. Deviation) [n]	Lower-middle income Mean (std. Deviation) [n]
Under-5 mortality 1997	133.2 (65.0) [60]	46.5 (36.9) [49]
Under-5 mortality 1990	135.7 (74.7) [40]	52 (37.7) [39]
Mortality change 1990 to 1997	10.3 (21.6) [39]	10.7 (11.6) [37]
Proportionate mortality change 1990 to 1997	0.05 (0.33) [39]	0.2 (0.2) [37]
Adult mortality, female, 1997	319.3 (128.9) [61]	144.9 (60.9) [47]
Adult mortality, female, 1990	315.4 (116.5) [55]	165.6 (80.0) [47]
Change adult mortality, female, 1990-1997	-8.5 (82.2) [55]	13.8 (27.4) [44]
% change adult mortality, female, 1990-1997	-0.05 (0.3) [55]	0.06 (0.15) [44]
Adult mortality, male, 1997	370.7 (118.1) [61]	225.7 (75.5) [47]
Adult mortality, male, 1990	383.6 (115.2) [55]	239.2 (78.3) [47]
Change adult mortality, male, 1990-1997	8.1 (75.4) [55]	7.0 (41.0) [44]
% change adult mortality, male, 1990-1997	0.007 (0.2) [55]	0.03 (0.2) [44]

Table 15: Relationship between Constraints Index and Mortality, Low income countries

	0 missing value	1 missing value	2 missing value	3 missing value
Under 5s				
Level 97	-0.342***	-0.344***	-0.362***	-0.345***
Level 90	-0.346***	-0.355***	-0.360***	-0.359***
90-97	0.084	0.034	0.036	0.056*
% 90-97	0.0006	0.0003	0.0003	0.0009
Adults, female				
Level 97	-0.558***	-0.603***	-0.569***	-0.562***
Level 90	-0.596***	-0.657***	-0.700***	-0.676***
90-97	0.063	0.157	0.122	0.134
% 90-97	0.0002	0.0005	0.0004	0.0006
Adults, male				
Level 97	-0.651***	-0.616***	-0.545***	-0.529***
Level 90	-0.725***	-0.714***	-0.725***	-0.695***
90-97	0.149	0.168	0.130	0.116
% 90-97	0.0002	0.0004	0.0003	0.0003

Level 97= Level in 1997; Level 90= Level in 1990; 90-97 = change from 1990 to 1997; % 90-97 = proportionate change from 1990 to 1997.

Models: Levels -- Mortality = $\alpha + \beta C + \varepsilon$, where C = constraints index

Changes -- Change mortality = $\alpha + \beta C + \gamma M + \varepsilon$, where C = constraints index, M = level of mortality in 1990.

*** = p<.01; ** = p<.05; * = p<.10

Table 16: Relationship between Constraints Index and Mortality, Lower-middle income countries

	0 missing value	1 missing value	2 missing value	3 missing value
Under 5s				
Level 97	-0.112*	-0.148***	-0.141***	-0.139***
Level 90	-0.142	-0.189***	-0.178***	-0.161***
90-97	-0.034	-0.034	-0.031	-0.029
% 90-97	-0.0008	-0.0008**	-0.0008**	-0.0008**
Adults, female				
Level 97	-0.285	-0.298***	-0.285***	-0.228**
Level 90	-0.394*	-0.421***	-0.394***	-0.316***
90-97	-0.059	-0.060	-0.048	-0.048
% 90-97	-0.0004	-0.0004	-0.0004	-0.0004
Adults, male				
Level 97	-0.238	0.040	0.034	0.086
Level 90	-0.346	-0.141	-0.136	-0.072
90-97	-0.161	-0.240***	-0.229***	-0.205***
% 90-97	-0.0005	-0.0008**	-0.0008**	-0.0007

Level 97= Level in 1997; Level 90= Level in 1990; 90-97 = change from 1990 to 1997; % 90-97 = proportionate change from 1990 to 1997.

Models: Levels -- Mortality = $\alpha + \beta C + \varepsilon$, where C = constraints index

Changes -- Change mortality = $\alpha + \beta C + \gamma M + \varepsilon$, where C = constraints index, M = level of mortality in 1990.

*** = p<.01; ** = p<.05; * = p<.10

Appendix 1. Individual constraints analysis (Low income countries)

Quartile	Literacy	Nurses/100,000 population	DPT coverage	Control of corruption	Government effectiveness	Access to health services	GDP per capita
1 (Low)	Lao PDR Bangladesh The Gambia Guinea-Bissau Pakistan Senegal Mozambique Ethiopia Burkina Faso Niger Benin Nepal	Central African Republic Eritrea Bangladesh Madagascar Liberia Chad Uganda Haiti Burkina Faso Nepal Mali Somalia Benin Afghanistan The Gambia	Uganda Haiti Korea Central African Rep Afghanistan Congo, Dem Rep Niger Angola Cameroon Somalia Liberia Chad Togo Nigeria	Azerbaijan Cameroon Sudan Congo Dem. Rep Somalia Nigeria Liberia Tajikistan Niger Tanzania Turkmenistan Honduras Myanmar	Nigeria Niger Congo Dem. Rep Myanmar Liberia Turkmenistan Kenya Haiti Somalia Sudan Angola Zimbabwe Tajikistan	Mali Liberia Chad Yemen Afghanistan Somalia Sierra Leone Niger Benin Angola Congo Dem Rep Cote d'Ivoire Mozambique	Congo Dem Rep Zambia Madagascar Mali Ethiopia Mozambique Guinea-Bissau Burundi Malawi Sierra Leone Niger Yemen Tanzania Nigeria
2	India Central African Republic Mauritania Mali Eritrea Haiti Sudan	Sierra Leone Cameroon Congo, Dem Rep Togo Pakistan Honduras Comoros	Sierra Leone Ethiopia Indonesia Cote d'Ivoire Cambodia Yemen, Rep. Lao PDR Sudan	Benin Kyrgyz Rep Pakistan Armenia Indonesia Nicaragua Zambia Chad	Chad Azerbaijan Pakistan Kyrgyz Rep Bangladesh Yemen Central African Rep	Myanmar Ethiopia Pakistan Senegal Mauritania Bangladesh Uganda Central African	Chad Uganda Central African Rep Tajikistan Eritrea Senegal Bangladesh

Quartile	Literacy	Nurses/100,000 population	DPT coverage	Control of corruption	Government effectiveness	Access to health services	GDP per capita
	Burundi Togo Cote d'Ivoire Malawi	Cote d'Ivoire Niger Indonesia India Myanmar Bhutan Sengal	Ghana Senegal Madagascar Mali Eritrea Kenya Guinea Burundi	Congo, Rep. Guinea Kkenya Yemen	Congo, Rep Malawi Armenia Cameroon Indonesia Nicaragua	Rep Togo Cambodia Haiti Guinea-Bissau Ghana	Benin Cambodia Congo, Rep Nepal Kenya Burkina Faso Togo
3	Madagascar Congo, Rep. Nigeria Rwanda Congo, Dem Rep Uganda Ghana Nicaragua Zambia Tanzania Comoros Cameroon	Sudan Lesotho Tanzania Nigeria Vietnam Kenya Guinea China Cambodia Nicaragua Yemen Guinea-Bissau Lao PDR Mauritania Ghana	Nepal Comoros Benin Zimbabwe Pakistan Bangladesh Mozambique India Armenia Solomon Islands Sao Tome and Principe Tanzania	Haiti Moldova Vietnam Zimbabwe Ethiopia Mali India Korea Mozambique Uganda Madagascar Burkina Faso	Mozambique Korea Lesotho Ghana Zambia Madagascar India Guinea-Bissau Togo Moldova Vietnam Tanzania Honduras	Indonesia Burundi Guinea Lao PDR Kenya Sudan Malawi Cameroon Bhutan Rwanda Honduras Tanzania Nigeria Lesotho Madagascar Zambia	Haiti Mongolia Cote d'Ivoire Comoros Lao PDR Vietnam Sao Tome and Principe The Gambia Pakistan Lesotho Sudan Cameroon Mauritania Bhutan
4 (high)	Vietnam Myanmar Lesotho	Tajikistan Turkmenistan Congo Rep.	Moldova Malawi Turkmenistan	China Ghana Guinea-Bissau	Mongolia The Gambia Cote d'Ivoire	China Burkina Faso Mongolia	Moldova Solomon Islands Ghana

Quartile	Literacy	Nurses/100,000 population	DPT coverage	Control of corruption	Government effectiveness	Access to health services	GDP per capita
	Indonesia Tajikistan Zimbabwe Armenia Kenya Honduras China Moldova	Sao Tome and Principe Angola Kyrgyz Rep. Azerbaijan Zambia Solomon Islands Zimbabwe Mongolia Moldova Korea Armenia	Vietnam Azerbaijan Myanmar Tajikistan Nicaragua The Gambia China Mongolia Kyrgyz Rep. Honduras Bhutan	Bangladesh Togo Mongolia Malawi Lesotho Senegal Sierra Leone The Gambia Cote d'Ivoire	Uganda China Guinea Mali Burkina Faso Ethiopia Senegal Benin Sierra Leone	Vietnam The Gambia India Zimbabwe Congo Rep Nicaragua	Kyrgyz Rep Honduras India Angola Azerbaijan China Indonesia Nicaragua Armenia Guinea Zimbabwe

Figure A1.1 Female literacy rates, low income countries

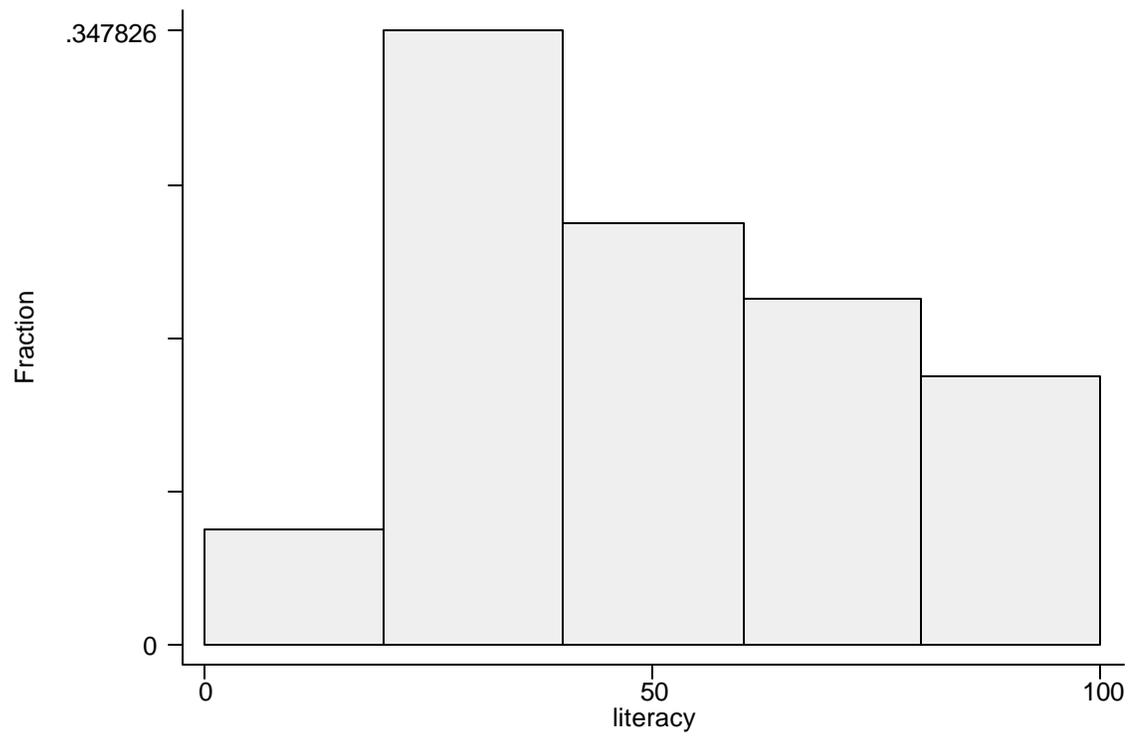


Figure A1.2 Nurses per 100,000 population, low income countries

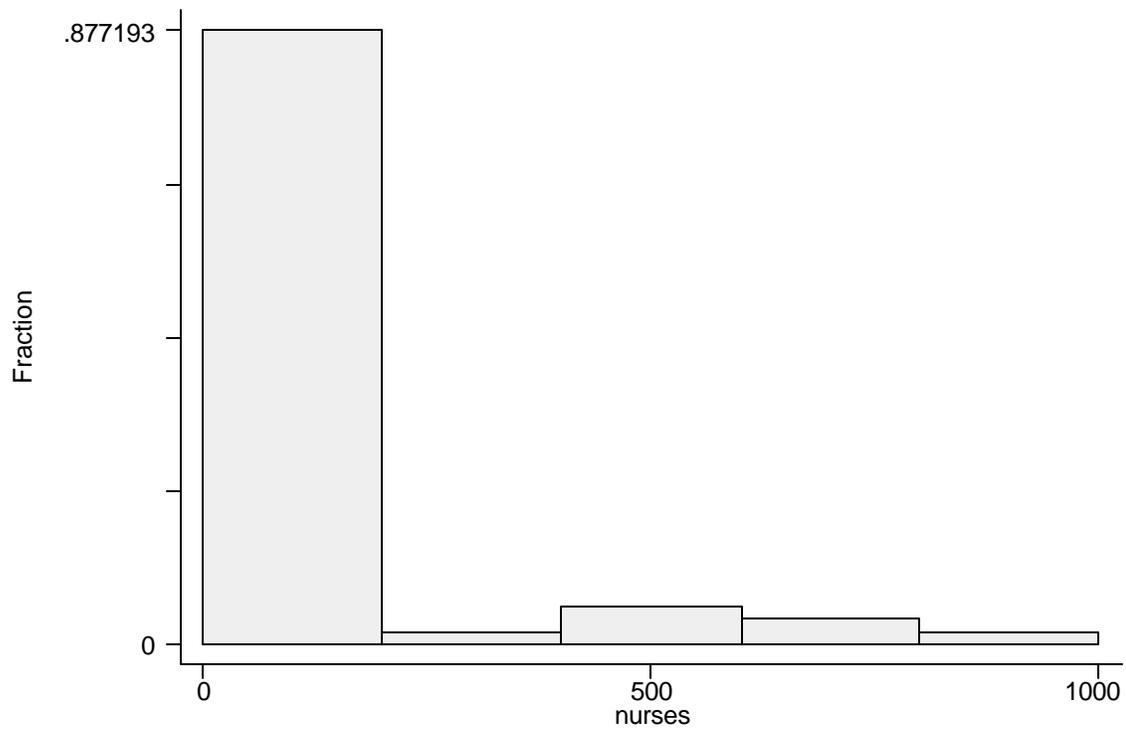


Figure A1.3 DPT coverage rates, low income countries

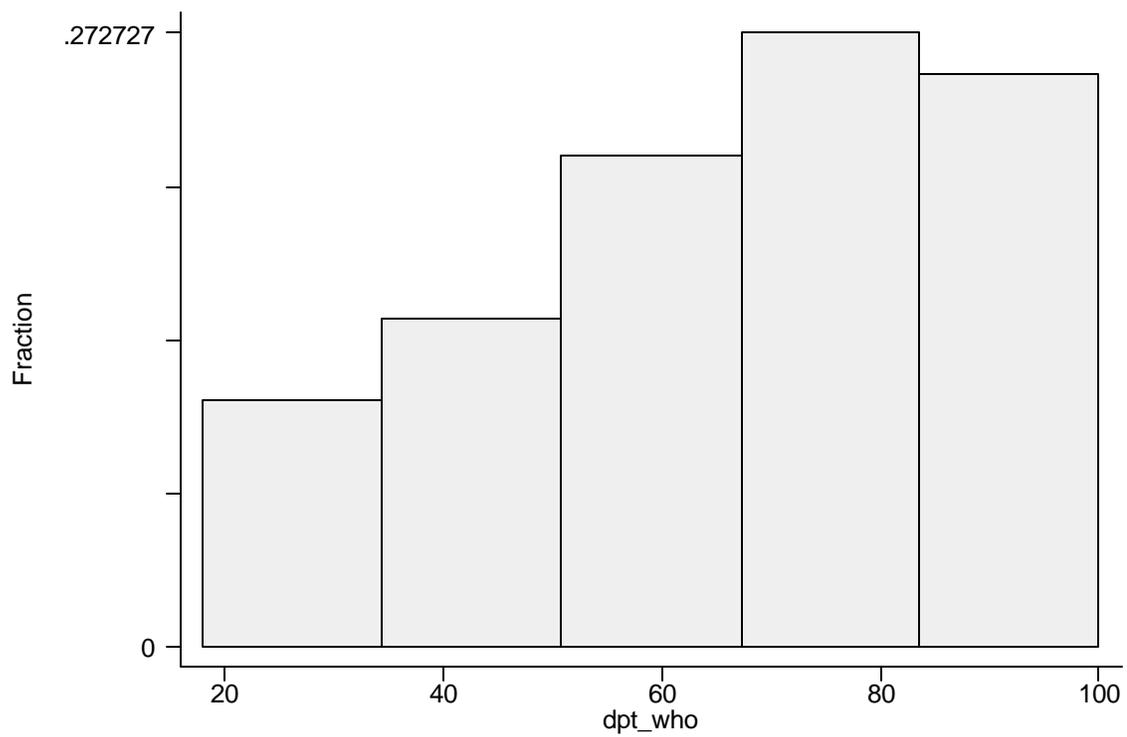


Figure A1.4 Control of corruption index, low income countries

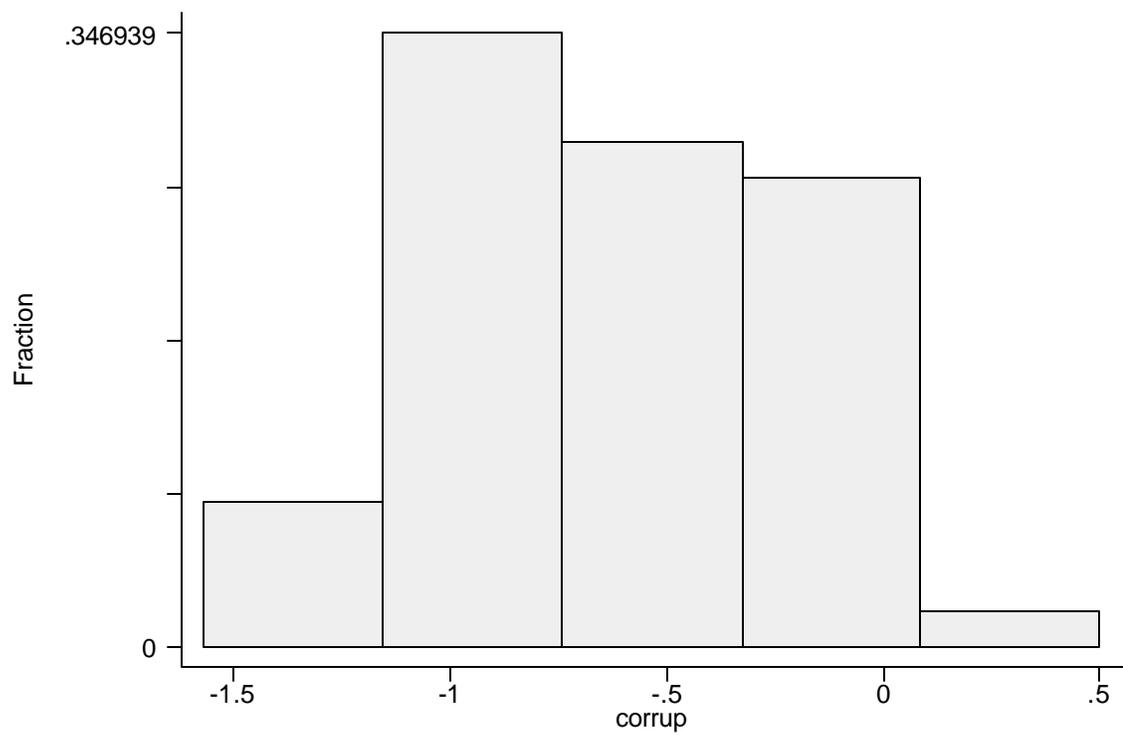


Figure A1.5 Government effectiveness, low income countries

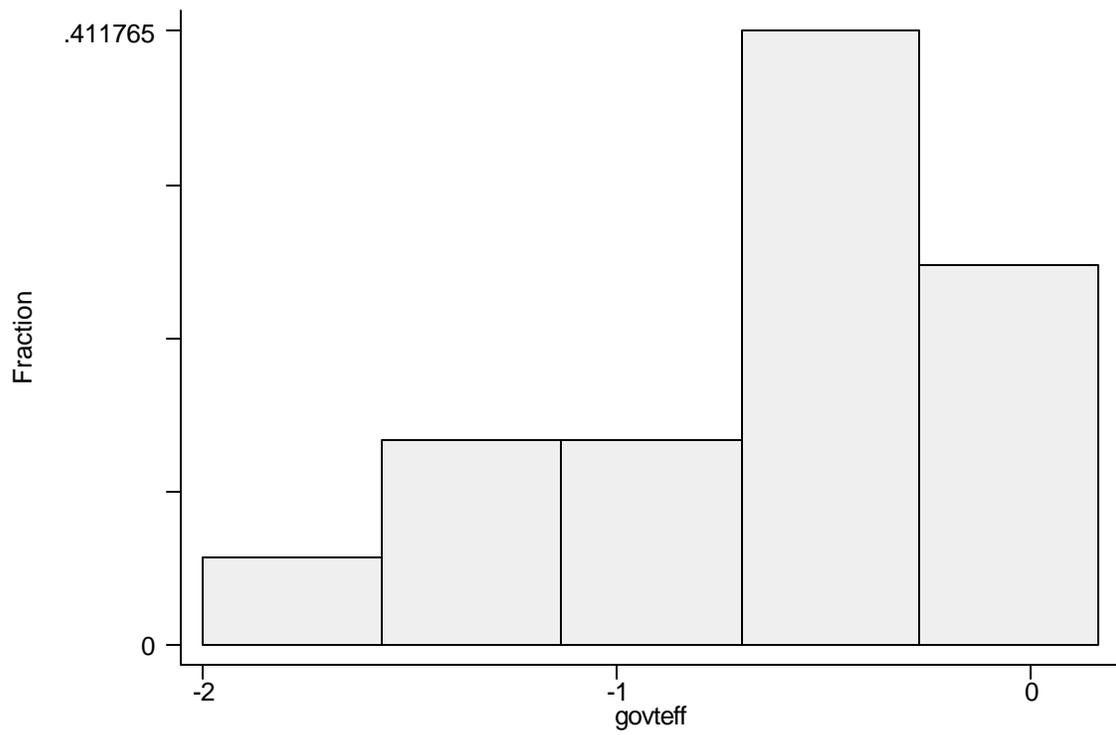


Figure A1.6 Access to health services, low income countries

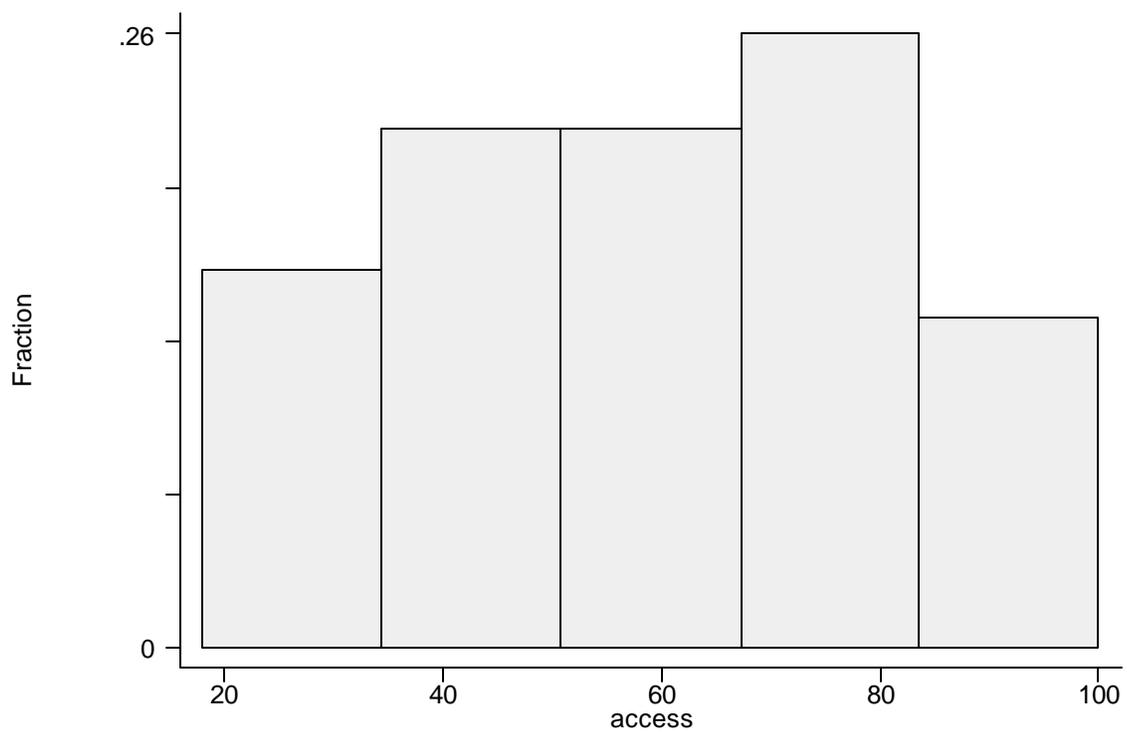


Figure A1.7 GDP per capita, low income countries

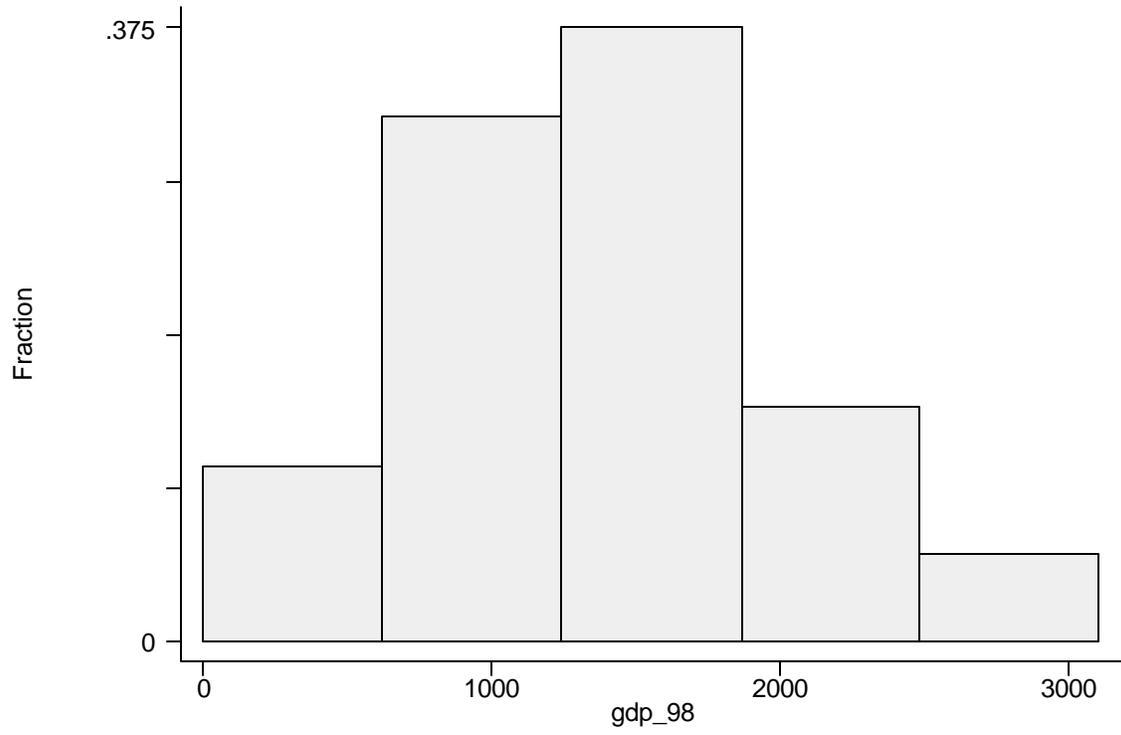


Figure A1.8 Proportion of population in the geographic tropics, low income countries

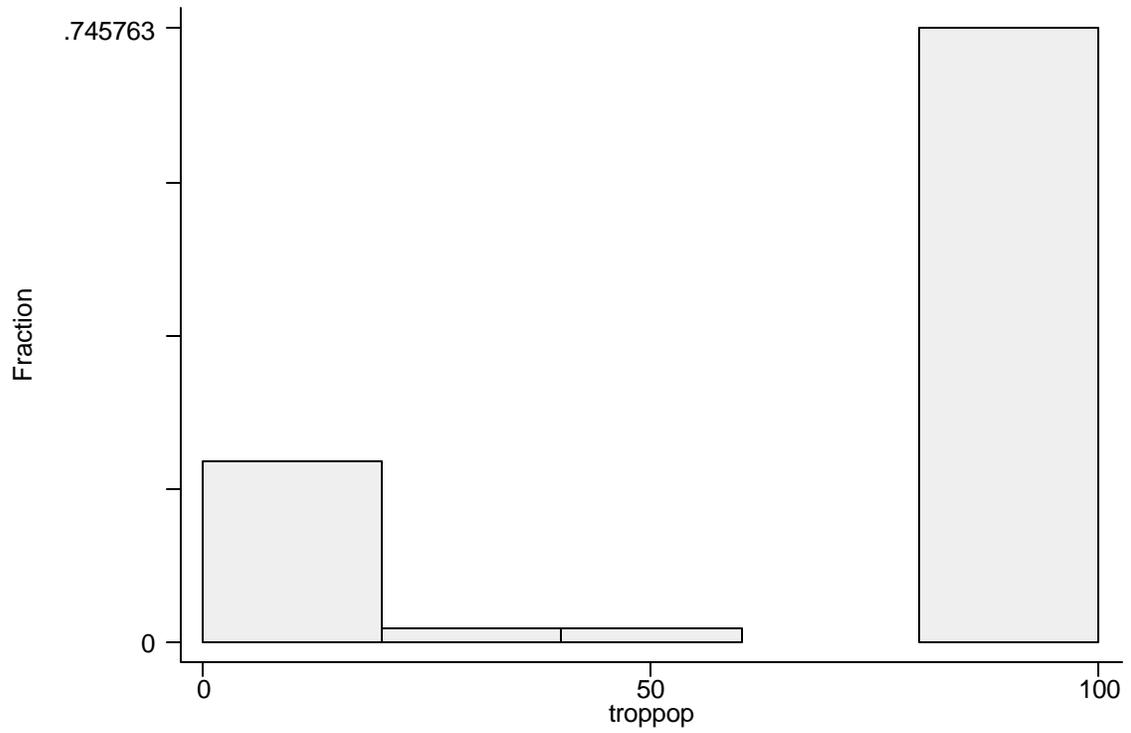


Figure A1.9 Female literacy rates, lower-middle income countries

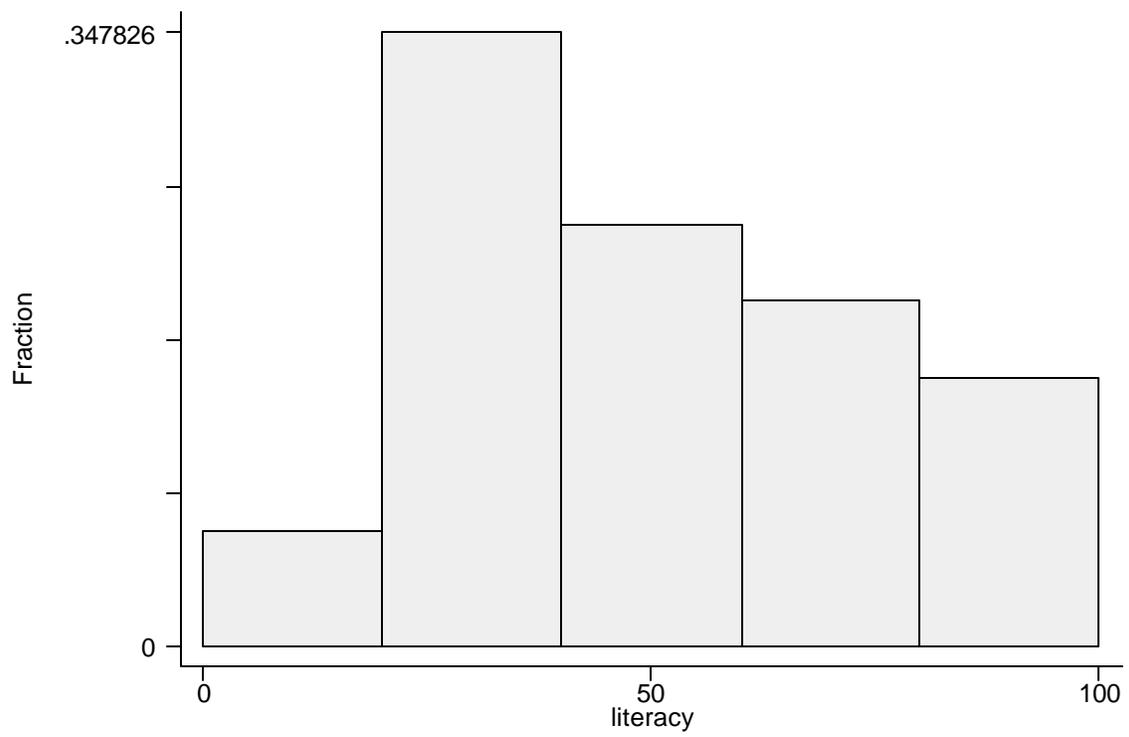


Figure A1.10 Nurses per 100,000 population, lower-middle income countries

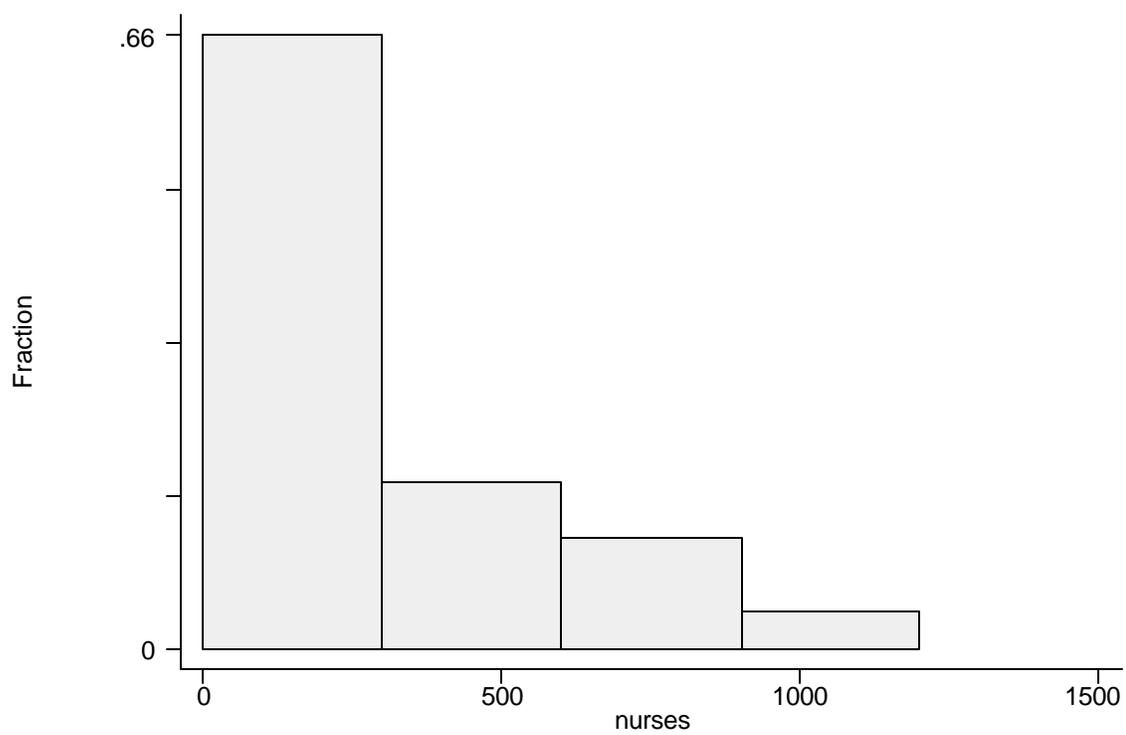


Figure A1.11 DPT coverage rates, lower-middle income countries

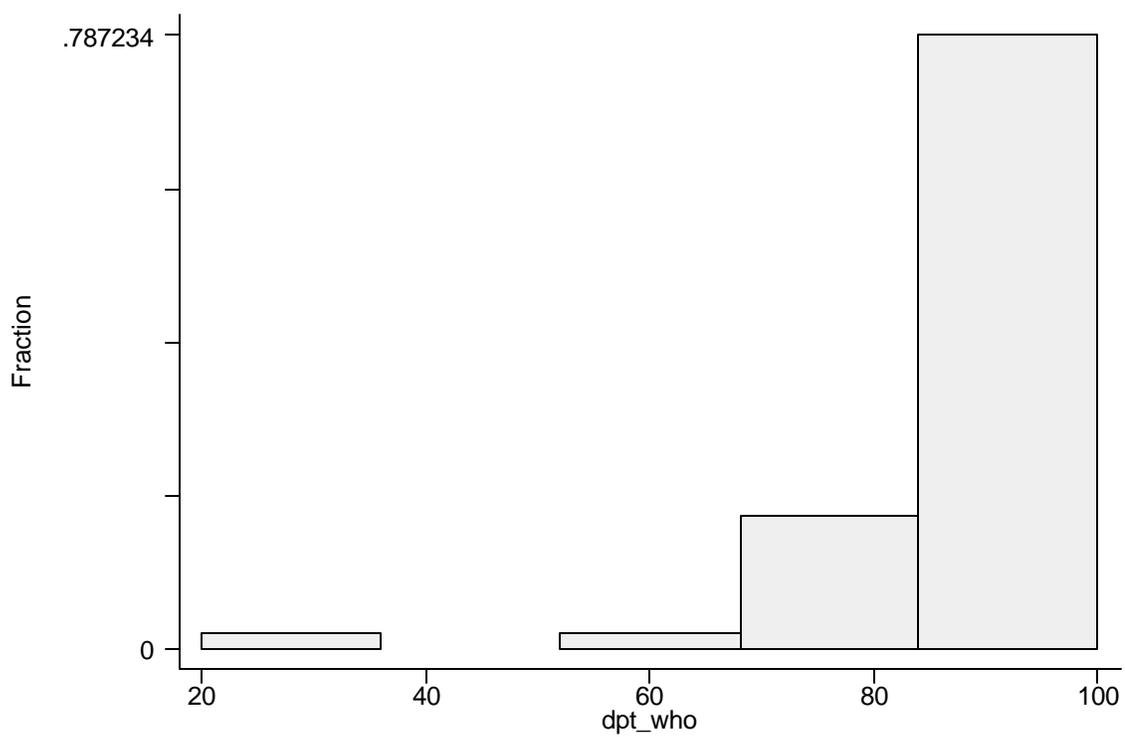


Figure A1.12 Control of corruption index, lower-middle income countries

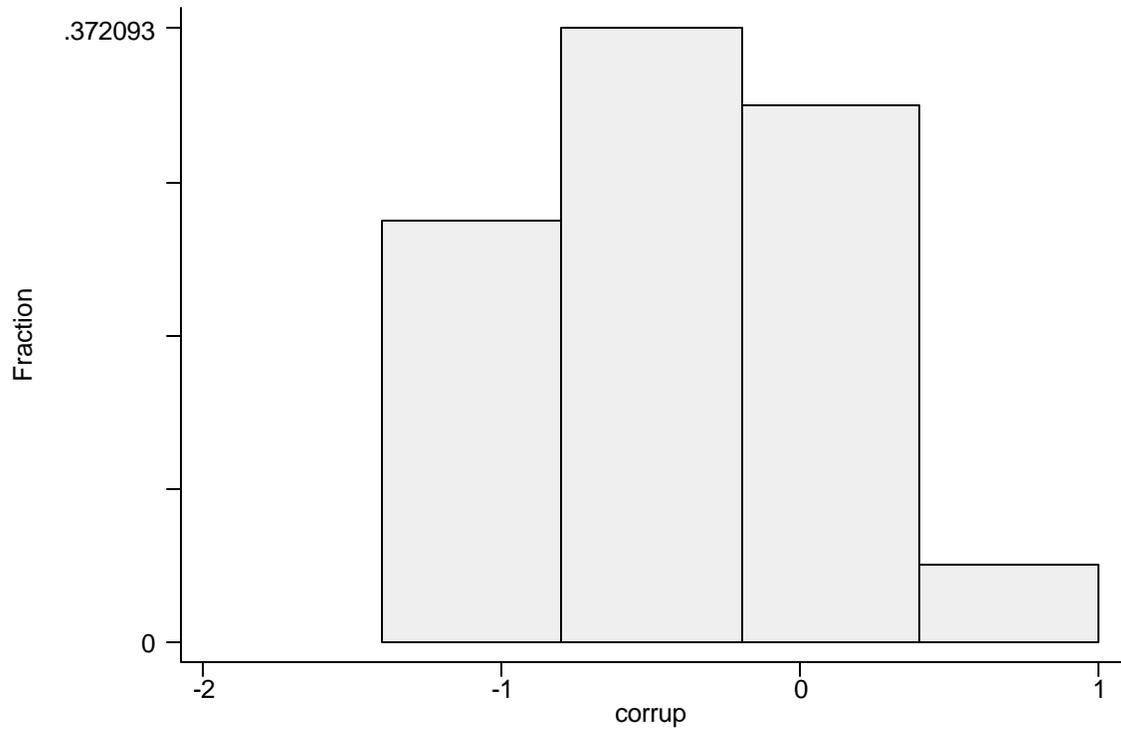


Figure A1.13 Government effectiveness, lower-middle income countries

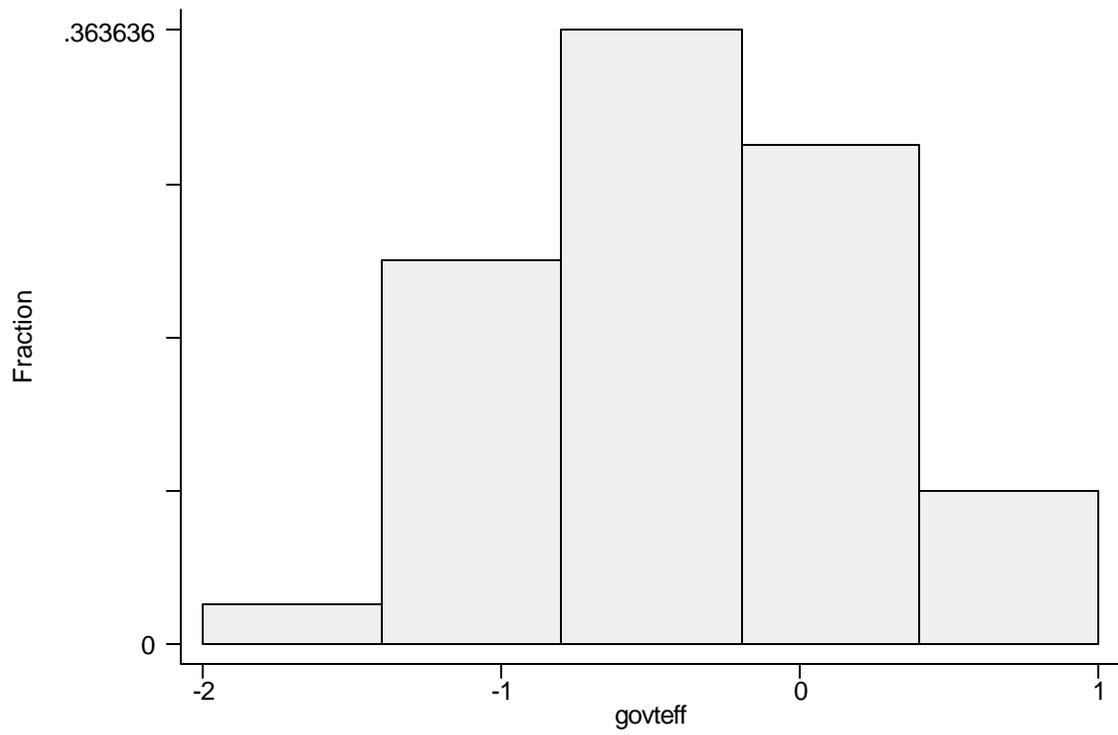


Figure A1.14 Access to health services, lower-middle income countries

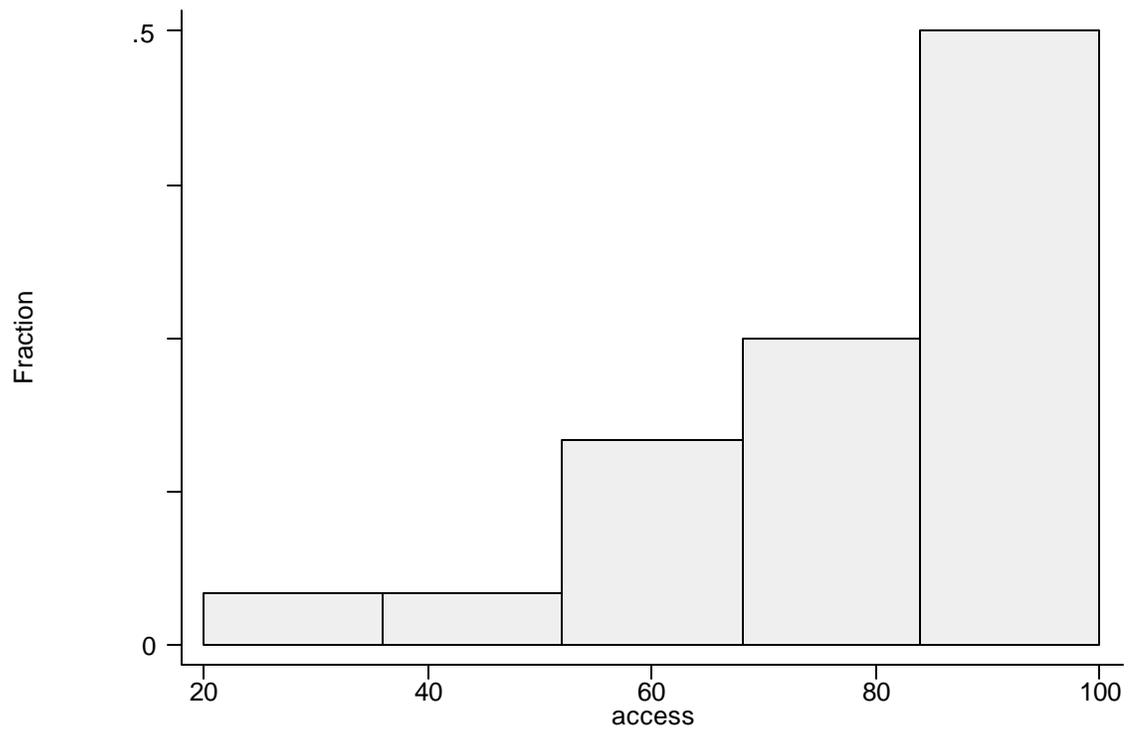


Figure A1.15 GDP per capita, lower-middle income countries

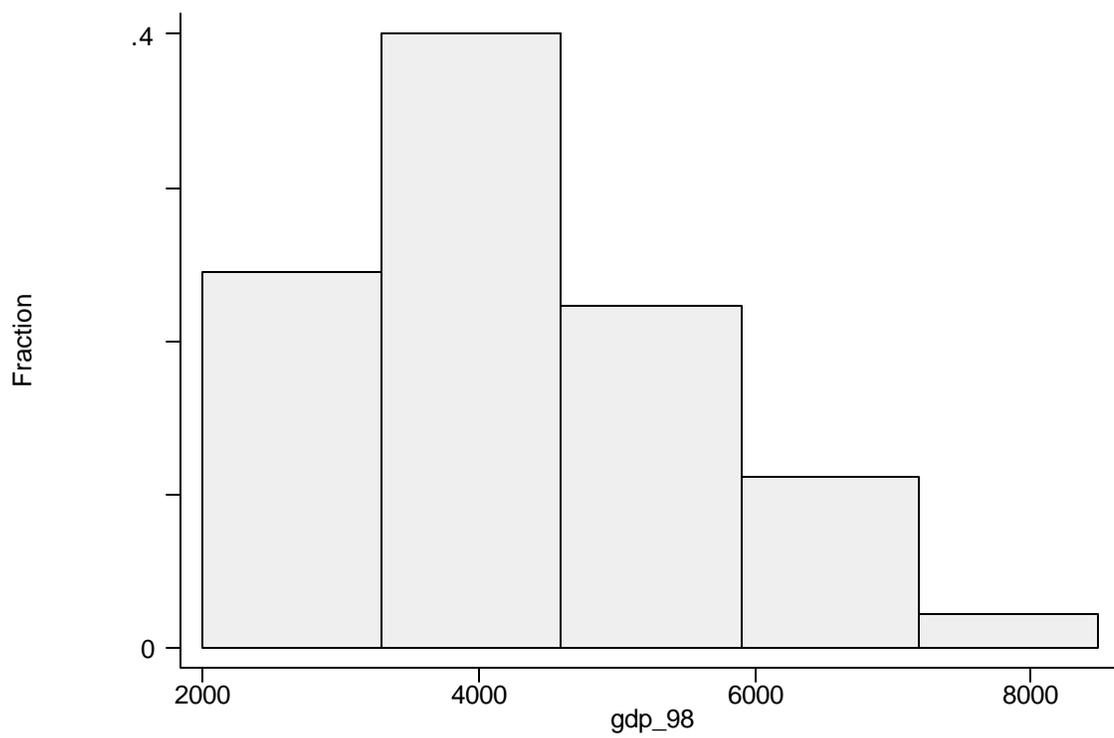
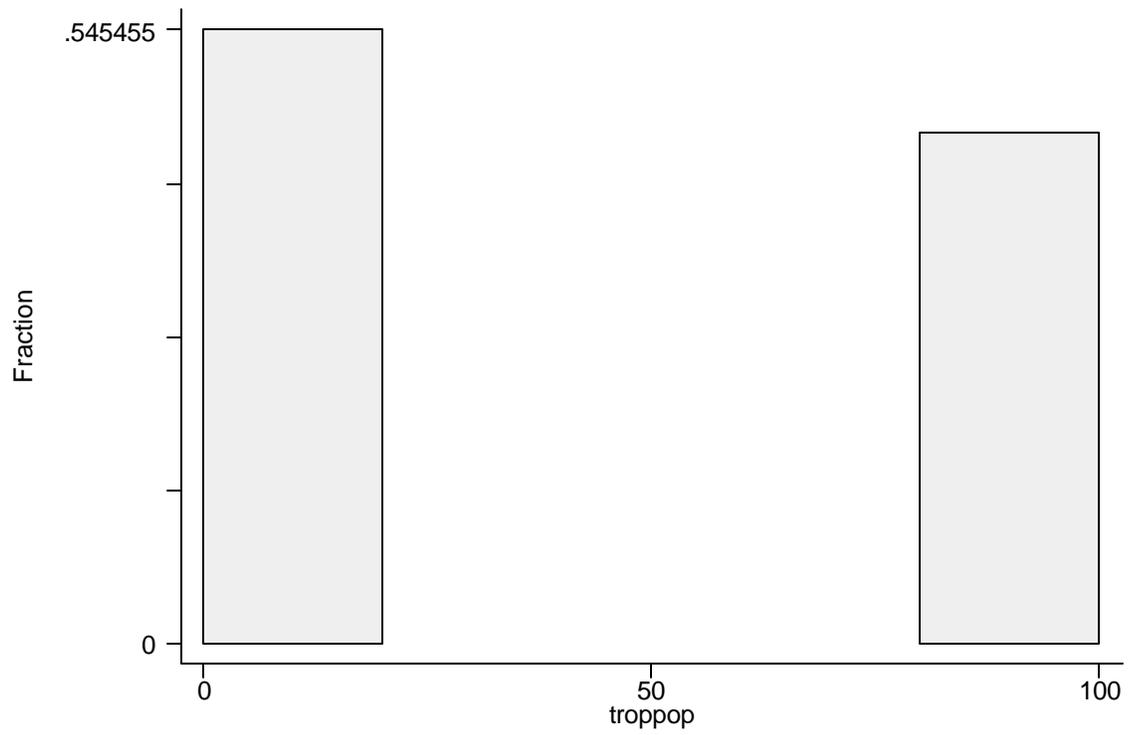


Figure A1.16 Proportion of population in geographic tropics, lower-middle income countries



Appendix 2: Graphs of cumulative distribution of constraints index to examine non-linearity.

Fig. A2.1 No missing values tolerated

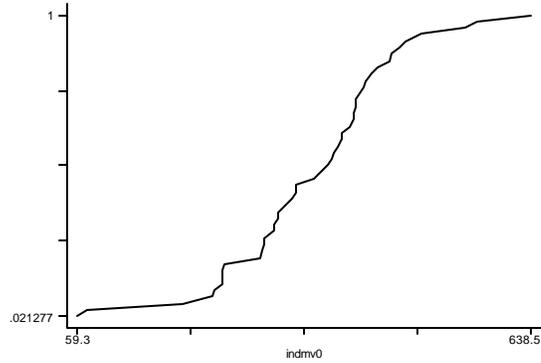


Fig A2.2 Up to one missing value tolerated

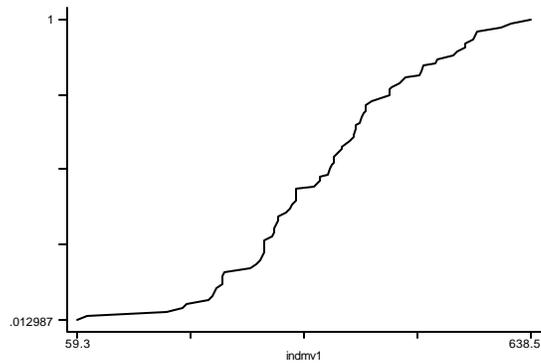
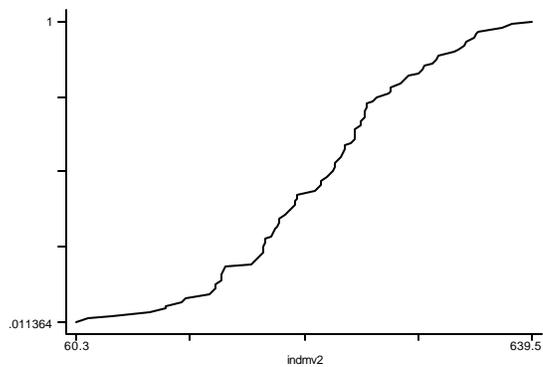


Fig A2.3 Up to 2 missing values tolerated



Appendix 3: Sensitivity analysis results

The aim of the sensitivity analysis was to determine how robust the classification of countries according to the constraints index was to a number of data-related choices. Analysis was undertaken by cross-tabulating classification into quartiles using alternative versions of the index. These cross-tabulations are summarised by the proportion of countries which shift from their original quartile (i.e. the number of countries which fall off the diagonal when the tabulations by quartile are compared). In addition, we have manually checked for the number of countries which shifted by more than one category when a parameter was varied.

Table A3.1 Percent of countries off-diagonal – Low income countries

	0 MV	1 MV	2 MV	3 MV
WHO vs. GAVI data on DPT coverage	0.22	0.16	0.22	0.17
Excluding GDP per capita in the index	0.12	0.11	0.02	0.19
Imputing “neutral” values for missing data	0	0.09	0.16	0.24
Changing tolerance for missing values*	0.04	0.07	0.10	
Excluding governance variables	0.38	0.25	0.26	0.34
DOTs vs. DPT coverage as health services vars	0.16	0.24	0.20	0.24

*Looks at how country classifications vary between index with 0 missing values compared with 1 missing value; 1 missing value compared with 2 missing values; and 2 missing values compared with 3 missing values.

Table A3.2 Percent of countries off-diagonal – Lower-middle income countries

	0 MV	1 MV	2 MV	3 MV
WHO vs. GAVI data on DPT coverage	0.67	0.35	0.31	0.32
Excluding GDP per capita in the index	0.33	0.06	0.08	0.21
Imputing “neutral” values for missing data	0	0.06	0.26	0.19
Changing tolerance for missing values*	0.33	0.06	0.11	
Excluding governance variables	0.52	0.40	0.42	0.47
DOTs vs. DPT coverage as health services vars	0.19	0.24	0.11	0.27

Appendix 4

Government Commitment Index: Methodological note

The following highlights a number of methodological issues relating to the government commitment index presented in Section 5.

1. **Baseline year:** The choice of the baseline year will directly influence the measurement of government performance. If 1990 was a particularly “good year” in a given country, using this year’s expenditure may set a norm which is an excessively or unsustainably high standard against which to measure subsequent expenditure levels. Alternatively, if expenditure in 1990 was particularly low for any reason, a country can perform very well in relation to 1990 without necessarily exhibiting particular commitment to the sector.
2. **Levels vs. use of resources:** The level of expenditure says nothing about how resources are spent. It is possible that additional expenditure is targeted on cost-ineffective services, or services that are not accessible to the poor. Time series data on how expenditure is divided between, say, primary and secondary level services is not available. One way to consider the “quality” of expenditure might be to take a broader perspective on commitment and look at overall social sector expenditure. However, time series data on education expenditure do not seem to be readily available. The WDI contains data on education expenditure as a share of GNP only for the years 1980 and 1997.
3. **The effect of regime shifts:** There are a number of countries which experienced very large shifts in health expenditure levels over the course of the time period. For example, health expenditure in Georgia fell from \$64 per capita in 1990 to \$2 in 1993. These problems appear to be particularly acute in countries where there were major changes in regime (especially the countries of the Former Soviet Union) which led to dramatic reductions in public health expenditure, and rapid currency devaluation that make comparisons over years of GDP or of health expenditure problematic. This further emphasises the difficulties of choosing an appropriate baseline year.
4. **The absolute value of index is influenced by the level of expenditure.** It would be possible to use a binary variable (= 1 if value > 0, i.e. more committed, and = 0 if value < 0, i.e. less committed), or to normalize the measure to be able to transform to a scale of 0-100 as for the other variables in the index. All suggestions welcome.