



## **Using quantitative methods to monitor government obligations in terms of the rights to health and education**

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**Edward Anderson**

School of Development Studies  
University of East Anglia  
Norwich, NR4 7TJ, UK  
edward.anderson@uea.ac.uk

**Center for Economic and Social Rights**

Madrid and New York  
[www.cesr.org](http://www.cesr.org)

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## Executive summary

This paper proposes a set of quantitative methods for assessing whether governments are complying with their obligations under the International Covenant on Economic, Social and Cultural Rights (ICESCR). The paper focuses in particular on the rights to health and education. The methods focus on how one can establish, with as much certainty as possible, whether a government has made sufficient effort to promote the rights to health and education, given the constraints it faces. The methods are designed to complement and build on existing methods used for this purpose by human rights groups and advocacy organisations.

The paper begins with a theoretical section (Section 2). This first discusses the nature of governments' obligations under the ICESCR. It is argued that these obligations require that a government's objective function – in other words, its goals, priorities and aspirations – must meet certain conditions. These conditions include:

- a) the rights set out in the ICESCR must be considered intrinsic objectives;
- b) attaining the minimum essential level of each right must be prioritised over all other objectives;
- c) the government must not prioritise some groups over others on the basis of characteristics such as gender, race or ethnicity;
- d) the government must place intrinsic value on equality, for example between men and women.

Section 2 goes on to describe three situations in which one can infer that a government's objective function does not meet the above conditions, and therefore that the government is not complying with its obligations under the ICESCR. These are situations in which there is an action the government could take, but is not taking, which would:

- 1) raise levels of realisation of at least one of the rights set out in the ICESCR, without reducing the levels of realisation of any other right;
- 2) raise realisation of the minimum essential level of at least one right, without reducing realisation of the minimum essential level of any other right; or
- 3) raise levels of realisation of the rights set out in the ICESCR among a more disadvantaged group by the same amount as, or by a greater amount than, it reduces levels of realisation among a more advantaged group.

Section 3 presents the methods themselves. The overall aim is to establish whether there are any actions a government could take, but is not currently taking, which meet any of the above three criteria. This is assessed in three stages.

The first stage is described in Section 3.1. It involves analysing the determinants of relevant health and education indicators in the country chosen for analysis. The aim here is to identify the factors which affect people's access to the goods and services which have an important effect on key health and education outcomes. The main method used is multiple regression analysis of household survey data. Section 3.1 also discusses how evidence from household surveys can be used to shed light on the minimum essential levels of the rights to health and education, and on levels of disadvantage among different groups in society.

The second stage is described in Section 3.2. The aim here is to identify and cost an action that the government could take, but is not currently taking, which would raise people's access to the goods and services which have an important effect on key health and education outcomes. Possible examples include a school building programme (education) or a vaccination programme (health). By cost, we refer to the amount of revenue the government would have to raise in order to finance the action. This may include, for example, the cost of school construction or the cost of purchasing vaccines. It is important to stress that the aim is not to prescribe specific actions which must be taken by the government. Instead, the aim is simply to outline one action a government could take, and to investigate its cost, as part of the overall approach to assessing whether the government is complying with its obligations.

The third and final stage of the overall approach is set out in Section 3.3. The aim here is to establish whether there are likely to be any adverse effects of raising the revenue requirements of the action identified and costed in the second stage, and if so whether those adverse effects are sufficiently large that they offset the positive effects of the expenditure itself. This is assessed using three simple rules of thumb:

- the first rule of thumb can be used to assess whether the government action would, in the short term at least, raise the level of a particular health or education indicator;
- the second rule of thumb can be used to assess whether the government action would raise or lower economic growth;
- the third rule of thumb can be used to assess whether any reduction in economic growth resulting from the government action is sufficiently large to offset its positive effect on health and education in the short run.

The first of these rules of thumb can be implemented using data generated by the first and second stages of the overall approach, while the second and third can be assessed using publicly available econometric evidence. They can then be combined into an overall assessment of whether an identified government action being considered would, over a specified period of time, raise either a) the level of realisation of the right to health or education, or b) attainment of the minimum essential level of the right to health or education, in each case either for a particular group or for the country as a whole.

Having presented the methods, Section 4 discusses the different sorts of variables and indicators which will be used in implementing the methodology in more detail. These include indicators of key health and education outcomes, the use of relevant goods and services, the quality of those goods and services, and the access factors which affect the use of relevant goods and services. This section also discusses sources of estimates of the determinants of economic growth, and the effects of economic growth on health and education, which are used in implementing the second and third rules of thumb. It also discusses other types of indicators, which although not part of the methodology itself are still relevant in other ways.

Section 5 discusses the main challenges, limitations and constraints likely to be faced when applying the proposed approach in any one particular country context. Five issues are discussed, namely data availability, model complexity, uncertainty regarding key relationships of interest, uncertainty regarding the precise nature of government obligations under the ICESCR, and finally issues relating to the rights to health and education in relation to all human rights. Although significant and not to be underestimated, these limitations and constraints are not such that they can undermine the proposed approach altogether. Finally, Section 6 outlines some additional tools which can be used to identify countries in which to apply the proposed approach.

## **1 Introduction**

This paper proposes a set of quantitative methods for monitoring economic, social and cultural rights. The methods are designed to assess whether governments are complying with their obligations under the International Covenant on Economic, Social and Cultural Rights (ICESCR). The paper focuses in particular on the rights to health and education, as set out for example in Articles 12, 13 and 14 of the ICESCR and General Comments 13 and 14 of the UN Committee for Economic, Social and Cultural Rights.

Governments' obligations under the ICESCR have been set out and discussed extensively elsewhere (e.g. Alston and Quinn 1987). The methods outlined in this paper cover three different dimensions of these obligations, namely:

- the requirement to take steps toward the *progressive realisation* of economic, social and cultural rights, to the maximum of available resources;
- the requirement to satisfy, as a matter of priority, certain *minimum core obligations*;
- the requirement to ensure that rights are exercised *without discrimination* of any kind, and to ensure *equal rights* across individuals and groups.

Further elaboration on the meaning of these different dimensions of government obligations under the ICESCR and other agreements is available in Felner (2007).

There are significant challenges when seeking to monitor government compliance with obligations in relation to the rights to health and education. This has been also been discussed extensively elsewhere (e.g. Robertson 1994, Raworth 2001). Most notably, while it may be clear that many people do not 'enjoy' their rights to health or education, it does not necessarily follow that the government is not complying with its obligations. This is because the government may be constrained in its ability to promote the enjoyment of those rights. The methods outlined in the paper are designed specifically to address this challenge. In other words, they go beyond measuring whether people enjoy their rights to health and education, and focus on how one can establish, with as much certainty as possible, whether a government has made sufficient effort or steps to promote the enjoyment of the rights to health and education, given the constraints it faces.

In recent years, human rights groups have been seeking to use analytical techniques, such as budget analysis, to hold governments to account for their human rights obligations. Recent summaries of these efforts, and the sorts of techniques proposed to date, include *Dignity Counts* (Fundar-IHRIP-IBG 2004) and *Budgeting Human Rights* (APRODEV 2007). The methods proposed in this paper are designed to build on this work, and in so doing improve the ability of human rights groups to hold governments to account for their human rights obligations. It is also hoped that the proposed methods will stimulate further work in this area. For further elaboration on the role that quantitative approaches can play in monitoring economic and social rights and holding governments to account, see Felner (2007).

The remainder of the paper is organised as follows. Section 2 provides a theoretical background which forms the basis for the quantitative methods proposed in the paper. Section 3 then describes the methods, while Section 4 outlines the data required to implement the methods and the sources from which the data can be obtained. Section 5 discusses the potential limitations and difficulties of the proposed methods, and how these may be addressed: it also discusses ways in which the methods could be extended. Finally, Section 6 considers the question of how a human rights advocacy organisation might go about identifying countries in which to apply the proposed methods.

The paper is designed for a wide audience, with discussion of technical material in a set of appendices at the end of the paper.

## 2 Theory

This section sets out the links, in theory, between government actions and progress towards, and attainment of, the rights to health and education. It also illustrates the choices and trade-offs which exist between the rights to health and education and other potential goals (e.g. economic growth).

### 2.1 Resource allocation and government obligations under the ICESCR

All governments make choices: for example, how much of the budget to spend on education and health, how much to tax different goods and services, and so on. The choices made obviously reflect a wide range of considerations involving complex trade-offs, competing priorities, and so on. However, it is possible to analyse these choices using a relatively simple basic framework. This considers the government as choosing the levels of a set of policy variables which maximise the level of its objective function, subject to a set of constraints (see Box 1).

#### **Box 1 The basic resource allocation framework**

A government's *objective function* summarises the objectives it is trying to achieve. These will typically be diverse and multi-dimensional: longer and healthier lives for citizens and an end to poverty and discrimination, for example. The objective function also summarises which (if any) of the objectives are considered to have higher priority. In many cases, of course, the government's objectives may simply be to raise the income of its members and its supporters.\*

A government's *policy variables* are the tools it has at its disposal to achieve its objectives. These are also likely to be varied, depending in part on prevailing views in society on the appropriate limits to government action, and also on the government's technical and administrative capacity. Examples include taxes and subsidies on goods and services (e.g. income taxes), direct provision of goods and services (e.g. public health and education), market regulation (e.g. minimum wages, price supports, affirmative action), and so on.

The *constraints* a government faces are the factors which limit its ability to attain its objectives using the tools at its disposal. One of the most important of these is the budget constraint, which requires that the amount the government spends cannot exceed the amount that it receives in revenue from taxation, borrowing or overseas aid.

\*Different objective functions corresponding to different models of the state are discussed in Lal and Myint (1996: 260-272). In each case the government's objectives can be summarised in terms of a fairly clear objective function, even though the types of objective function differ.

An important question is how governments' obligations under the ICESCR affect this basic framework. This is a difficult question to answer, but it is important if we are to spell out governments' obligations under the ICESCR more explicitly. The importance of doing this has been noted in recent work in this field. For example, Streak (2001: 21) argues that 'the contribution of child budget analysis to child socio-economic rights realisation would be far greater if the budget obligations associated with the "within available resources" and "progressive realisation" clauses were to become more explicit'. Similarly, Norton and Elson (2002: 22) note that 'the question remains of how the adoption of a rights perspective would modify the process of developing policy goals, strategies, plans and budgets in practice'.



Here, it is argued that a government's obligations under the ICESCR require that their objective function meets certain conditions. These requirements are derived and set out formally in Appendix 1. To summarise, the requirements are that:

- the government's objective function must include the realisation of the rights set out in the ICESCR as intrinsic objectives which matter in and of themselves;
- attaining the minimum essential level of each right set out in the ICESCR must be prioritised over any other objectives the government may hold;
- the government must not prioritise some groups over others, purely on the basis of the characteristics outlined in Article 2.2 of the ICESCR or any others considered relevant from a human rights perspective;
- the government must place at least some intrinsic importance on equality in levels of realisation of the rights set out in the ICESCR across individuals and/or groups.

It is not claimed that these requirements are the only ways in which governments' obligations under the ICESCR, or human rights considerations more broadly, affect the basic resource allocation framework. This is something around which there is potential for further debate and discussion. It is claimed, however, that the ICESCR does require a government's objective function to meet the above requirements, even if the ICESCR itself does not use these exact words.

## 2.2 *Monitoring compliance with obligations under the ICESCR*

A government's objective function cannot be observed directly, through official documents for example. Instead, in order to get a true reflection of its objectives and priorities, one must look at its actual choices and decisions.

In this context, it is vitally important to know when we can infer that a government's objective function does not meet one or more of the four requirements set out in the previous section. This is set out and explained in detail in Appendix 2, but the main points can be summarised as follows. First, we can infer that the government's objective function does not meet the first requirement if:

- there is an action (or step) that the government could take which would raise levels of realisation of at least one of these rights without reducing the levels of realisation of any other right, and this action is not being taken.

(A government step or action can be defined more formally as a change in one of its policy variables.)

Second, we can infer that the government's objective function does not meet the second requirement if:

- there is an action that the government could take which would raise realisation of the minimum essential level of at least one right, without reducing realisation of the minimum essential level of any other right, and this action is not being taken.

Third, we can infer that a government's objective function does not meet the third and fourth requirements if:

- there is an action the government could take which would raise levels of realisation of the rights set out in the ICESCR among a more disadvantaged group by the same amount as, or by a greater amount than, it reduces levels of realisation among a more advantaged group, and this action is not being taken.

If a potential government step or action meeting any one of these three criteria can be identified, then the government's objective function would not meet the ICESCR's requirements. It would then be possible to say that a government is not complying with its obligations under the ICESCR. The great difficulty lies in establishing whether a particular action that a government could take would raise levels of realisation of a particular right, or enable attainment of the minimum essential level of a right. This is discussed further in Sections 2.3 to 2.5.

### 2.3 *Clarifying the realisation of the rights to health and education*

Here we discuss briefly the meaning of the realisation of a particular right, and the minimum essential level of a right. To simplify the analysis, we restrict our attention from now on to the rights to health and education.

It is generally accepted that a person's level of realisation (or enjoyment) of the right to health or education does not necessarily refer to their attainment of some particular health or education outcome: being educated or being healthy, for example. More fundamentally, it refers to a person's level of access to the goods and services which contribute to key health and education outcomes (e.g. CESCR General Comment 14: 3). This distinction is set out more formally in Appendix 3. The distinction reflects various considerations, including the fact that individuals may in some cases choose not to make use of goods and services which contribute to key health or education outcomes, despite having access to them. For example, someone may fast for religious or political reasons, while others may adopt unhealthy or risky lifestyles out of personal choice (CESCR General Comment 14: 4).

It is also generally accepted that the minimum essential level of the right to health or education relates to whether or not a person has access to those goods and services which are essential for attaining key health or education outcomes, and not necessarily to whether or not those outcomes have been attained. This is again set out more formally in Appendix 3.

The notion of access is a common one in the human rights field and is referred to on several occasions in the ICESCR and associated General Comments. It can be broken down into different categories, such as economic accessibility (also referred to as affordability), physical accessibility, and non-discrimination (e.g. General Comment 14:4). It is also possible to consider the notion of availability (ibid.: 4) as another

component of a broader notion of access, even though it is treated separately in the General Comments.

In some cases, however, the notion of access has limited relevance. For example, it makes little sense to distinguish between a child's access to primary education and immunisation against life-threatening diseases, and his or her actual use of these services. In addition, we would not expect large differences between a person's access to essential goods and services and their actual use of them. Furthermore, the goods and services to which people have access must be of sufficient quality and be culturally relevant and acceptable (e.g. General Comment 14: 5) if they really are to contribute to key health and education outcomes. It is important to bear these qualifications in mind when talking about levels of realisation of the right to health or education.

#### *2.4 Government actions and the rights to health and education*

Assessing levels of realisation or enjoyment of the rights to health and education is of course only one side of the coin. The more pressing concern is to assess whether the various duty-bearers, and the government in particular, have complied with their obligations. This is the 'obligations approach' to human rights monitoring (Raworth 2001).

There are various types of action that a government can take to raise levels of realisation of the right to health or education. First, there are actions which raise access to the goods and services which contribute to, or are essential to, key health and education outcomes. These can be divided into five main headings, namely:

- provide additional public health and education services;
- subsidise private health and education services;
- provide cash or in-kind transfers;
- promote economic growth;
- tackle discrimination through legislation.

There are also certain other legislative measures that a government can take which can strengthen the link between a person's access to goods and services which contribute (or are essential to) key health and education outcomes, and their actual use of these goods and services. These include making the use of certain health and education services compulsory and prohibiting child labour.

These government actions which can raise levels of realisation of the rights to health and education are set out and discussed further in Appendix 4. Each type of action can be linked to the human rights notions of government obligations to respect, protect and fulfil the rights to health and education. For now, however, the important point is that the vast majority of government actions have revenue implications: i.e. they require the government to raise revenue in some way. Legislative measures, which may appear at first sight to have few revenue implications, typically require at least some enforcement costs if they are to be effective.

Given this, the effects of raising revenue must be taken into account before we can say what the overall impact of a government action on levels of realisation of the right to health or education will be. This is discussed further in Section 2.5.

### 2.5 *Assessing revenue constraints*

The need to assess potential revenue constraints raises clear challenges regarding monitoring a government's compliance with its obligations under the ICESCR. To discuss this further, we first identify the main sources through which the government could raise the revenue requirements of a particular action, namely:

- reallocation of expenditure;
- domestic taxation;
- government borrowing;
- international aid.

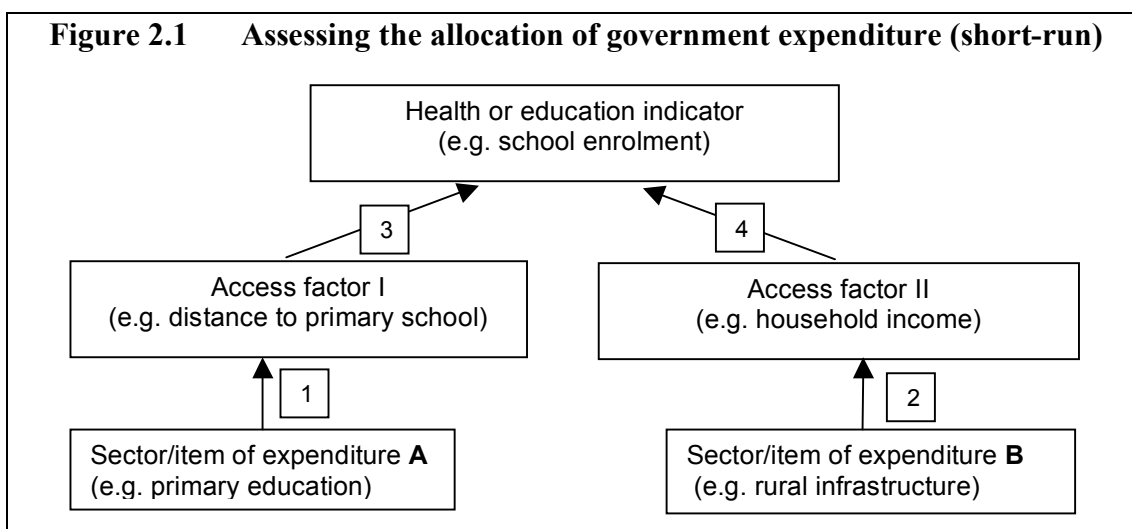
In some cases, it may be possible for a government to raise revenue through one or more of these sources without affecting the levels of realisation of any of the rights set out in the ICESCR. This would be the case, for instance, if it was currently spending a significant amount on unnecessary defence expenditure, or if a large amount of revenue was lost from the budget each year through corruption. It would also be the case if it had access to a significant amount of international aid, provided in pure grant form and without conditions attached. In such cases, revenue constraints could not be used to justify a government not taking a particular action.

In arguably the more usual case however, the direct effect of raising revenue will be to reduce levels of realisation of at least some rights, for at least some groups, currently or in the future. For example, a reallocation of expenditure away from higher education could reduce the availability of trained staff for providing basic health and education services in future years. Alternatively, a reallocation of expenditure away from transport could reduce the physical accessibility of health and education services in rural areas.

These effects could turn out to be small, but it is still necessary to consider them carefully. More specifically, it is necessary to establish whether the positive direct effects of a government step or action outweigh the negative indirect effects of raising the necessary revenue. This can be done using a detailed and potentially quite complex economic model, but three rules of thumb, derived from more general principles, can also be used.

The first rule of thumb can be used to assess the effect of a reallocation of government expenditure in the short term. This method has been developed in recent work by Ferroni and Kanbur (1991) and Collier *et al.* (2002). The basic approach is to estimate the effect of a small change in government expenditure in each of two different sectors on the level of a particular health or education. If these effects are very different, this would indicate that the government could raise the level of the health or education indicator being considered simply by reallocating its expenditure between the two sectors.

This approach is outlined in more detail in Appendix 5, but the basic idea is summarised in Figure 2.1. The levels of expenditure in two sectors, referred to as A and B (e.g. primary education and rural infrastructure), are shown. Each affects a particular ‘access factor’, e.g. the distance children must travel to school (I) and household income (II).<sup>1</sup> Each access factor in turn affects a particular health or education indicator (e.g. school enrolment). If effects (1) and (3) are smaller than effects (2) and (4), this suggests that a reallocation of expenditure from A to B will raise the health or education indicator being considered, and vice versa.



This first rule of thumb can be applied using evidence obtained from the analysis of household survey data combined with evidence on the costs of government actions. In principle, it can also be used to assess whether a rise in taxation would, again in the short term at least, raise the level of a particular health or education indicator.

The second rule of thumb is designed to assess whether a government action would raise or lower economic growth. Empirical evidence suggests there is a close relationship between economic growth and improvements in a range of health and education indicators, and that this at least partly reflects a direct causal effect (see Section 4.4). In other words, economic growth is an intermediary variable which affects future levels of realisation in several different economic and social rights.

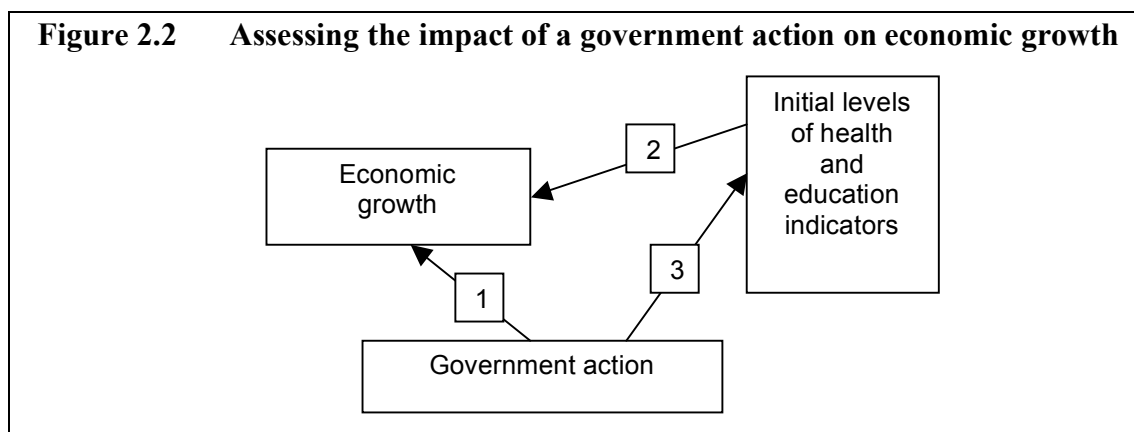
This second rule of thumb is derived and set out in more formal terms in Appendix 6, but the basics can be summarised as follows. The first step is to express the overall effect of a government action on economic growth as a function of three separate effects, namely:

- 1) the effect of raising the revenue requirements of the action on economic growth, holding the level of relevant health and education indicators constant;
- 2) the effect of those health and education indicators on economic growth, holding the level and/or composition of government expenditure constant;

<sup>1</sup> The term ‘access factor’ is defined and discussed in more detail in Sections 3.1 and 4.1.

- 3) the short-run effect of the government action on the level of the relevant health and education indicators.

These three effects are illustrated in terms of a flow diagram in Figure 2.2. The larger (in absolute terms) effect (1) is, the more likely it is that an action will reduce economic growth, while the larger effects (2) and (3) are, the more likely it is that an action will raise economic growth.



The second step is to obtain estimates of the likely magnitude of effects (1), (2) and (3). Estimates of the size of effect (3) can be obtained from the results of the first rule of thumb, while estimates of effects (1) and (2) can be obtained from econometric evidence (discussed further in Section 4). The final step is to combine these estimates in an overall assessment of whether a government action will increase or reduce economic growth. In principle, this method can also be used to assess the effects of a government action on growth in other intermediary variables, such as the supply of trained health and education personnel.

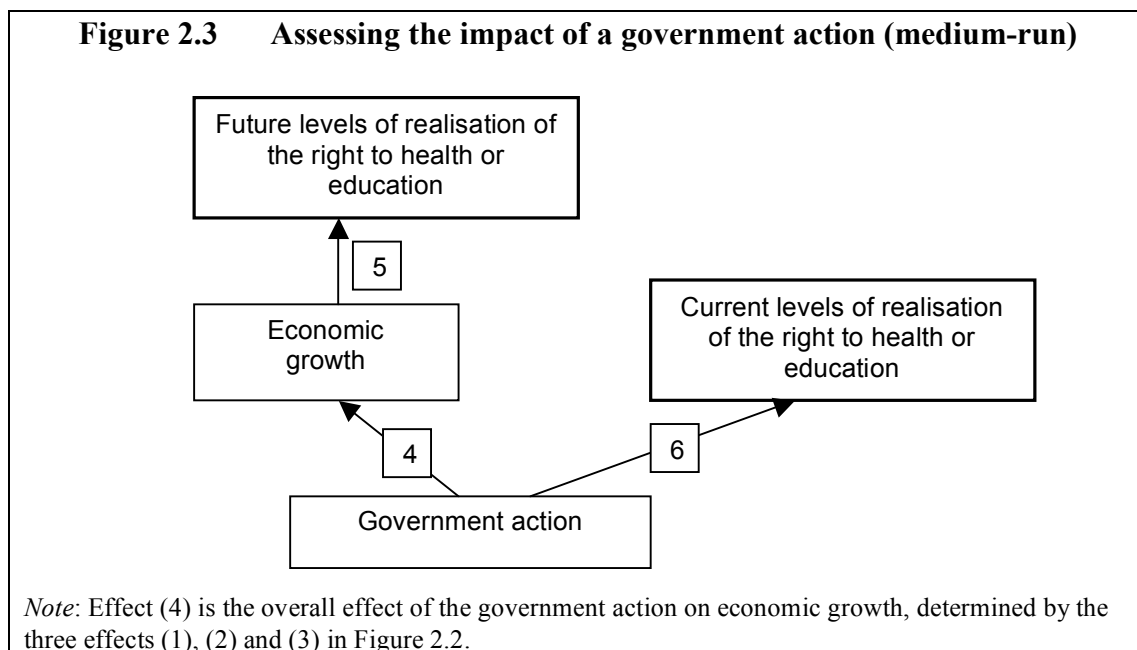
The third rule of thumb is designed for situations in which a government action is considered (via the first rule of thumb) likely to increase levels of realisation of the right to health or education in the short run, but (via the second rule of thumb) likely to reduce economic growth. This involves considering the effect of economic growth on future levels of realisation of the right to health or education.

This rule of thumb is derived and set out in more formal terms in Appendix 7, but again the basics can be summarised as follows. The first step is to express the overall effect of a government action on the level of realisation of the right to health or education, over a given period of time, as a function of three effects. These are:

- 4) the overall effect of the government action on economic growth;
- 5) the effect of economic growth on future levels of realisation of the right to health and education;
- 6) the short-run effect of the government action on the level of realisation of the right to health or education.

These effects are also illustrated in terms of the flow diagram in Figure 2.3. Clearly, if effect (4) does happen to be negative, then the overall effect of the government action,

over a specified period of time, could be to reduce the level of realisation of the right to health or education. However, this need not be the case if effect (5) is relatively small in size, while effect (6) is large in size.



The second step is to obtain estimates of the likely magnitudes of effects (4), (5) and (6) in Figure 2.3. These can be obtained from the application of the first rule of thumb (effect 6), the second rule of thumb (effect 4), and further econometric evidence (effect 5).

The final step is to combine these magnitudes into an overall assessment of whether the government action will, over a specified period of time, raise or reduce the level of realisation of the right to health or education. Clearly, time plays an important role in this overall assessment. Given a sufficiently long time-frame, any government action which reduces economic growth will eventually lower the level of realisation of a particular right, however large the short-run impact. The third rule of thumb assumes therefore that the time-frame over which government actions are assessed is not so long as to make it unnecessary.

This therefore sets out the principles underlying simple rules of thumb which can be used to assess the potential revenue constraints facing a government. We now turn to a presentation of the methodology itself.

### 3 Methodology

This section presents the proposed methodology for monitoring the three dimensions of government obligations under the ICESCR, as set out in Section 1. There are four main stages involved.

The first stage (Section 3.1) involves analysing the determinants of relevant health and education indicators. The second (Section 3.2) involves identifying, on the basis of the analysis in the first stage, government actions which could potentially promote realisation of the right to health or education, or attainment of the minimum essential level of the right to health or education, and estimating their likely cost. The third step (Section 3.3) involves assessing the constraints to meeting these costs. The final step (Section 3.4) involves an overall assessment as to whether a potential government action would promote realisation of the right to health or education, or attainment of the minimum essential level of the right to health or education.

#### 3.1 *Analyse determinants of health and education indicators*

The first stage of the methodology is to analyse the determinants of relevant health and education indicators. This stage can be thought of as seeking to ‘reveal, as a prelude to appropriate policy responses, whose rights are not being fulfilled and why’ (Gibbons *et al.* 2005: 226). The main method used is multiple regression analysis, while the main source of data is household surveys. The health and education indicators analysed include *outcome* indicators (e.g. child survival, literacy), indicators of the *use* of goods and services which contribute to these outcomes (e.g. calorific intake, immunisation, primary education), indicators of the *quality* of those services (e.g. teacher-pupil ratios), and indicators of the *access factors* which affect a person’s use of health or education services (e.g. household income, user fees, discrimination). More information on these sorts of indicators and their sources is provided in Section 4.

The following sub-sections (3.1.1–3.1.6) propose a series of steps to be followed when carrying out this stage of the analysis. A further sub-section (3.1.7) discusses how the results can shed light on the minimum essential levels of the rights to health and education, while a final sub-section (3.1.8) discusses how they can shed light on levels of disadvantage among different groups.

##### 3.1.1 *Initial descriptive analysis*

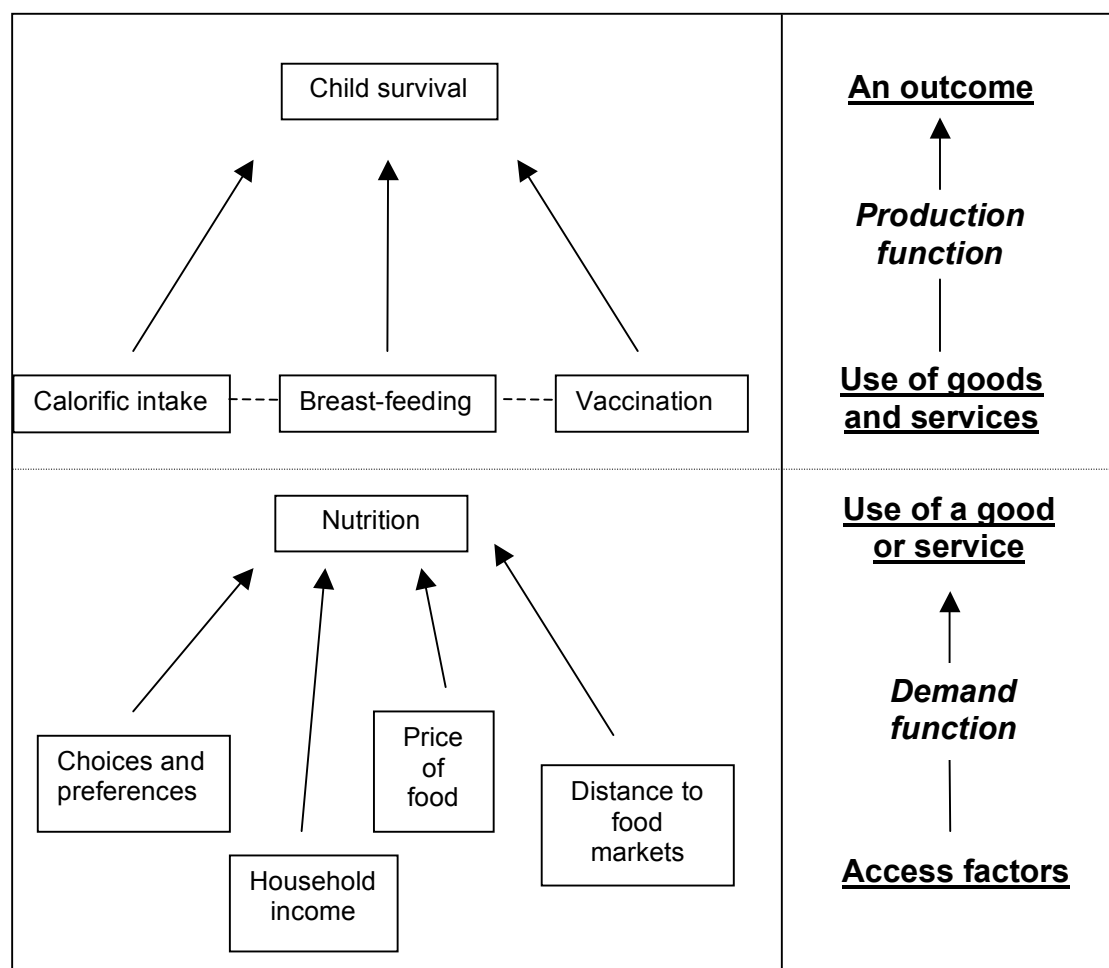
A useful first step is to present some simple descriptive analysis of the indicator(s) being analysed. A good example of this is provided by Gibbons *et al.* (2005). Their interest is in analysing the determinants of school attendance among children aged 7–14. The study focused on 18 countries in sub-Saharan Africa, using data from Multiple Indicator Cluster Surveys and Demographic and Health Surveys between 1999 and 2001. Prior to their more detailed regression analysis, they present a table showing the proportion of children enrolled in school across different sub-groups of the population: girls versus boys, urban areas versus rural areas, caretaker educated versus not caretaker-educated, and so on (*ibid.*: Table 10.5). This gives a good first impression of the sorts of factors which affect whether or not a child is enrolled in school.



### 3.1.2 Choice of dependent and explanatory variables

The second step is to determine the dependent and explanatory variables to be used in the regression analysis. This will be based on an underlying conceptual framework describing the relationships between the variables, including direct and indirect (or mediated) effects. Although the precise framework being used will depend on the particular context, there is a common framework which should be used as a guide. This framework assumes a simple hierarchical relationship for any one particular health or education outcome (see Figure 3.1). In this relationship, the access factors determine the use of relevant goods and services, while the use of relevant goods and services in turn determines the level of attainment in the outcome being considered.

**Figure 3.1 A basic conceptual framework for guiding regression analysis**



*Note:* The dashed lines between the goods and services shown in the upper part of the figure indicate that the use of one good or services is likely to be correlated with the use of another.

The framework summarised in Figure 3.1 will be familiar to economists. In economic terminology, the relationship between the use of goods and services (and their quality) and the level of attainment in a health or education outcome is referred to as a health and education production function, while the relationship between the access factors

and the use of a particular good or service (of a given quality) is referred to as a health or education demand function.<sup>2</sup>

The framework in Figure 3.1 also has much in common with the well-known Mosley and Chen (1984) framework. In this framework, child survival is the outcome being considered; the determinants of this outcome are then classified in terms of proximate determinants (e.g. nutrient deficiency, environmental contamination) and underlying socio-economic determinants (e.g. household income/wealth, norms and traditions). In Figure 3.1, the use of relevant goods and services can be thought of as the proximate determinants of any given outcome, while the access factors can be thought of as the underlying socio-economic determinants.

Three further points about this framework are worth noting. First, it can be used to trace through the effect of an access factor (e.g. household income, user fees) on a particular health and education outcome. In particular, we can use demand functions to estimate the effect of an access factor on the use of different goods and services, and then a production function to estimate the effect of those goods and services on a particular outcome. For example, if the abolition of tuition fees is found to increase the probability that a child is enrolled in school from 50% to 90% (an increase of 40%), and enrolment in primary school raises the probability that a person is literate from 20% to 90% (an increase of 70%), then the abolition of tuition fees would increase the probability that a person is literate from 55% to 83% (an increase of  $40 \times 70 = 28\%$ ).<sup>3</sup>

Second, there may well be differences in the size of each of the effects shown in Figure 3.1, across individuals and groups in society, for example by age, gender, or ethnicity. This can be explored and investigated in the regression analysis, in ways which are set out in Section 3.1.5.

Third, in practice there are differences in the quality of goods and services which affect health and education outcomes. These are relevant, since the quality of a good or service will affect its use, and it will also affect the effect of its use on health or education outcomes. To give an example, higher teacher-pupil ratios may well raise pupils' learning achievements once they are in school, as well as raise the number of children who enrol in school. For this reason, the regression analysis of both production and demand functions should include measures of the quality of relevant goods and services as explanatory variables.

As mentioned above, Figure 3.1 is a simple framework, which means it could be extended, in particular by adding more levels to the hierarchy and causality chain. One obvious extension is to incorporate the mutual interdependencies between different outcome indicators (see Figure 3.2). This sets out more explicitly that higher attainment in one outcome is likely to raise attainment in other outcomes.

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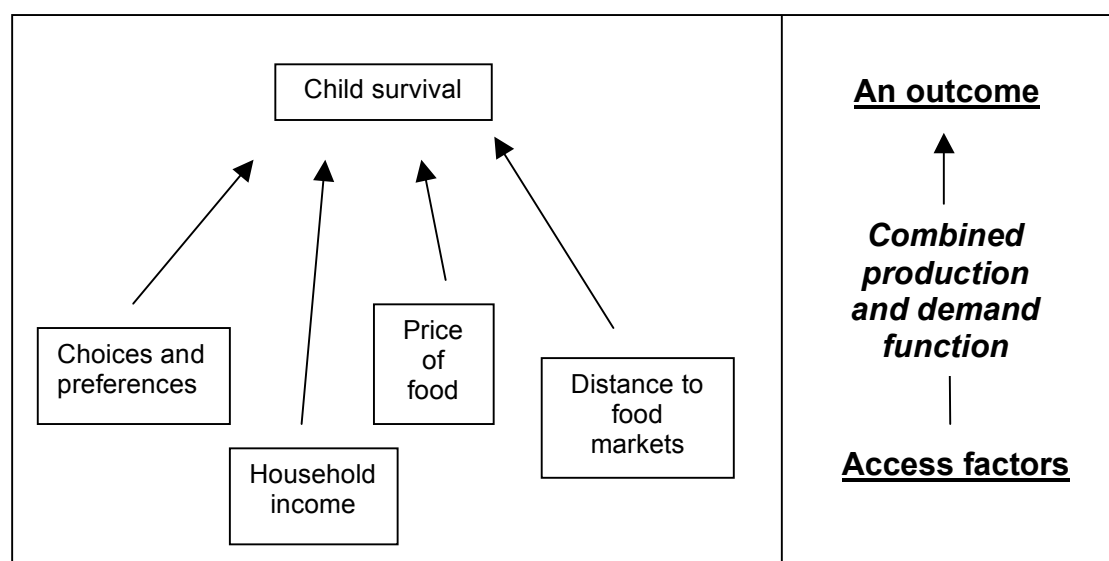
<sup>2</sup> A large number of analyses of health and education production and demand functions have been carried out by economists in recent years. For a survey, see Strauss and Thomas (1995).

<sup>3</sup> It is important to remember when doing this sort of analysis that one access factor will typically affect the use of several relevant goods and services, each of which may affect a particular health or education outcome.

However, this extension is not strictly necessary as long as we recognise two things. The first is that use of a particular good or service is likely to affect the level of attainment of many outcomes. The second is that the effects of each good and service on a particular outcome (i.e. the arrows in the upper panel in Figure 3.1) are the total effects, which allow for their effects on other outcomes.<sup>4</sup>

When it comes to applied work, it might in fact be necessary to use a simpler framework, in which the access factors determine the level of attainment of a particular health or education outcome (see Figure 3.2). This simpler framework is relevant, for instance, if data on the use of relevant goods and services are not available. When using this simpler framework, we simply note that the effect of each access factor on the outcome being considered is indirect; in other words, it operates by affecting the use of relevant goods and services, which in turn affect the outcome being considered.

**Figure 3.2 A simpler conceptual framework**



Finally, it should be emphasised that the conceptual framework is not designed to provide a complete account of every single possible determinant of a particular health or education outcome. Instead, its purpose is to show the main relationships between the variables which are commonly available in household survey data, and at least some of which (the access factors in particular) can be influenced by government policy actions.

To summarise, when it comes to deciding the dependent and explanatory variables to be used in the regression analysis, there are three choices:

- 1) the dependent variable measures the level of attainment in a health or education outcome, while each explanatory variable measures the use and/or

<sup>4</sup>More technically, the relationships in the upper panel in Figure 3.1 are reduced-form relationships. These reduced-form relationships will be the solutions to a potentially complicated system of simultaneous equations, but the structural parameters of this system do not need estimating for the purposes of this analysis. This is discussed further in Appendix 5.

quality of a good or service thought to affect that outcome (as in the upper panel in Figure 3.1);

- 2) the dependent variable measures the use of a relevant good or service, while each explanatory variable measures an access factor thought to affect the use of that good or service (as in the lower panel in Figure 3.1), or measures the quality of the good or service;
- 3) the dependent variable measures the level of attainment in a health or education outcome, while each explanatory variable measures an access factor thought to affect the use of goods and services which are thought to affect the outcome (as in Figure 3.2).

It should be clear that the correct selection of dependent and explanatory variables is possible only if, prior to the analysis, a careful categorisation of available indicators is made between outcome indicators, use indicators, quality indicators and access factors. More discussion on these different types of indicators (including examples and possible sources) is provided in Section 4.

### *3.1.3 Choice of regression technique*

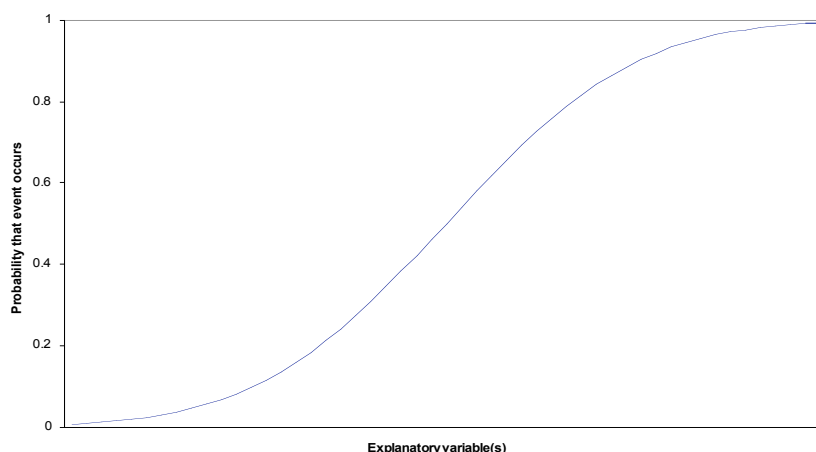
The next step is to decide on the type of econometric method to be used. The most relevant method is multiple regression analysis. This approach is designed specifically for situations where several explanatory variables affect a dependent variable, as in Figures 3.1 and 3.2, and where the different explanatory variables are likely to be correlated to some extent. Multiple regression analysis allows the researcher to estimate the effect of each explanatory variable on the dependent variable, while avoiding biases arising from correlation among the explanatory variables.

For example, a researcher might wish to estimate the effect of breast-feeding on infant survival. However, mothers who breast-feed may also be more likely to vaccinate their children. The implication is that, in a simple regression with infant survival as the dependent variable and breast-feeding as the explanatory variable, the estimated effect of breast-feeding on infant survival would reflect, at least in part, the effect of vaccination on infant survival. Thus the researcher could attribute a large effect to breast-feeding, when in truth it had only a small effect. For this reason, even if the researcher was only interested in the effect of breast-feeding, he or she would use multiple regression analysis, and include (i.e. control for) vaccination as well as breast-feeding among the explanatory variables, in order to obtain an accurate, unbiased estimate of the effect of breast-feeding.

The precise method of multiple regression analysis chosen depends to a large extent on the type of health or education indicator being analysed. For instance, many health and education indicators are dichotomous variables, each one indicating whether a particular outcome (e.g. surviving to age one, being literate) has been attained, or whether a particular service is made use of (e.g. whether or not a child is immunised, whether or not a child is attending school). Analysing dichotomous variables requires

the use of Probit, Logit or Weibull econometric models.<sup>5</sup> These models all assume that there is an S-shaped relationship between the probability that something happens (e.g. an outcome is attained, or a service is used), and the variables thought to affect that probability (see Figure 3.3).

**Figure 3.3 Regression analysis with dichotomous dependent variables**



*Note:* The solid curve indicates the regression line which is estimated by Probit, Logit or Weibull analysis.

These techniques are used by Ssewanyana and Younger (2005) to analyse the determinants of infant survival rates in Uganda (see Box 2). A similar analysis for Kenya is provided by Mariara (2007). The techniques are also used by Collier *et al.* (2002) to analyse visits to health centres in Ethiopia, and by Gibbons *et al.* (2005) to analyse school enrolment in 18 African countries.<sup>6</sup>

Other health and education indicators are continuous variables, meaning that they can take a range of values. These include a child's weight-for-age ratio or a person's calorific intake, for example. In such cases, the econometric analysis can be carried out using more standard techniques, beginning with ordinary least squares analysis. In some cases, some transformation of the indicator being analysed may be required, prior to the econometric analysis, to ensure the relationship between the dependent variable and each explanatory variable is (approximately) linear. This can often be achieved, for example, by taking logarithms of the dependent and/or explanatory variables.

#### 3.1.4 Interpretation of results

The fourth step is to interpret the regression coefficients that are obtained from the econometric analysis. (These coefficients represent the regression results, and are automatically generated by any econometric software package.) If the dependent

<sup>5</sup> Probit, Logit and Weibull models are examples of a more general class of econometric methods referred to as 'limited dependent variable' methods. This term refers to the fact that the indicator being analysed (referred to as the dependent variable) can take on a limited range of values.

<sup>6</sup> The studies by Ssewanyana and Younger (2005) and Mariara (2007) estimate the effect of access factors on an outcome indicator. For reasons explained in Section 3.1.2, this combined production-demand function approach is often used, mainly for reasons of data availability.

variable is a continuous variable, the regression coefficients indicate the effect of each explanatory variable on the dependent variable. In particular, they will indicate either:

- a) the effects of different health and education services, and their quality, on the level of attainment of a particular health or education outcome (production function analysis);
- b) the effects of different access factors on the amount of use of a particular good or service (demand function analysis); or
- c) the effects of different access factors on the level of attainment of a particular health or education outcome (combined production-demand function analysis).

In each case, the effects are calculated under the assumption that all other explanatory variables included in the regression analysis are held constant. (Possible differences in the size of the effects across groups in the population are discussed in Section 3.1.5).

If the dependent variable is a dichotomous variable, the regression coefficients do not have this straightforward interpretation, and the effects of each explanatory variable on the dependent variable must instead be calculated separately. Most econometric software packages will automatically calculate the average effect of each explanatory variable on the dependent variable; these are referred to as marginal effects. These averages can sometimes be misleading, however. For this reason it is also useful to show, in a table or a graph, how the effects of each explanatory variable vary. For example, the results of Ssewanyana and Younger (2005) imply that being vaccinated has a larger impact on the probability that a child survives to age 1 among poorer households than among richer households (see Box 2).

It should also be noted that when the dependent variable is dichotomous, the calculated effects have a slightly different interpretation. In particular, they will indicate either:

- d) the effects of different health and education services, and their quality, on the probability that a particular health or education outcome is attained (production function analysis);
- e) the effects of different access factors on the probability that a particular good or service is used (demand function analysis); or
- f) the effects of different access factors on the probability that a particular health or education outcome is attained (combined production-demand function analysis).

As with the continuous variable case, each effect is calculated under the assumption that all other explanatory variables do not change.

## Box 2 Determinants of infant mortality rates in Uganda

Ssewanyana and Younger (2005) estimate the determinants of infant mortality in Uganda, using evidence from three DHS surveys (1988, 1995 and 2000), and a Probit model. Some of their results are shown below. The numbers in the right-hand column in the table are the estimated 'marginal effects' of each variable, namely the effect of an increase in each explanatory variable on the probability that a child survives to age 1, holding all other variables constant, and averaged over all children in the sample.

Thus the authors find that, on average, a 100% increase in household wealth raises the probability of survival by 2.1 percentage points, being vaccinated increases the probability by 3.2 percentage points, and receiving prenatal care increases the probability by 3.0 percentage points. They also find that a mother's primary education raises the probability of survival by 1.4 percentage points, while education to secondary level raises the probability by 2.6 percentage points. Of these, the effects of household wealth, vaccinations and mother's education to secondary level are statistically significant.

### Effect of different explanatory variables on infant mortality, Uganda

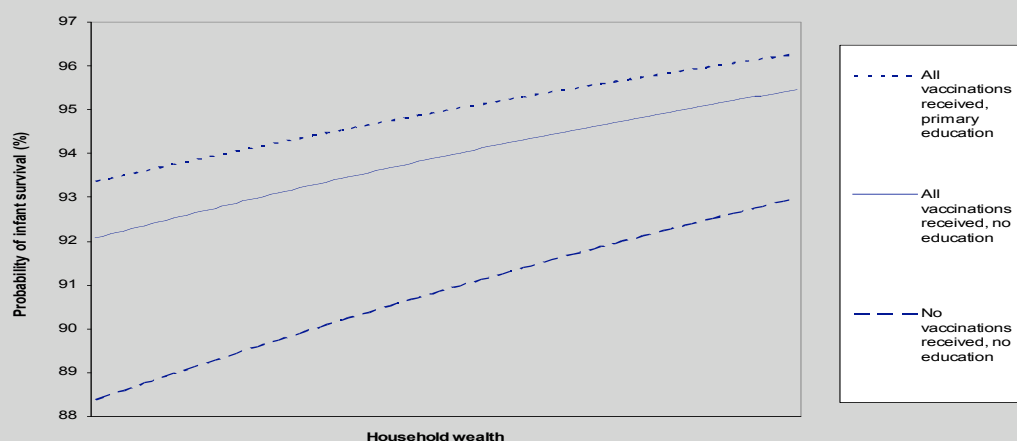
<i>Explanatory variable</i>	<i>Unit of measurement</i>	<i>Effect on probability of infant survival (% points)</i>
Household wealth	Continuous (log scale)	2.1*
Primary education**	Dichotomous (0,1)	1.4
Secondary education**	Dichotomous (0,1)	2.6*
Vaccinations	Dichotomous (0,1)	3.2*
Prenatal care	Dichotomous (0,1)	3.0

Notes: \* statistically significant at 5% level; \*\*of mother, completed. For the full set of results, see source.

Source: Younger and Ssewanyana (2006, Table 2 column 3).

As noted, the numbers shown in the table refer to the average effects of each variable. To see how these effects are likely to vary, the graph below plots, on the basis of the underlying regression coefficients, the estimated probability that a child in Uganda survives to age 1, according to the household's wealth, whether or not the child is vaccinated, and whether or not the mother is educated to primary level. Being vaccinated is shown to have a greater effect on the probability of survival, the lower the household wealth.

### Estimated probabilities of infant survival in Uganda



Note: The average infant survival rate in Uganda over the period in question was 91%.

Source: Author's calculations based on results of Ssewanyana and Younger (2005).

It is standard practice when reporting regression results to report the statistical significance of each regression coefficient. In this context, the concept of statistical significance refers to how confident a researcher can be that the true value of the coefficient (i.e. across the population, not just the households included in the survey) is not zero. (Any econometric software package will automatically generate the standard error of each regression coefficient, and the associated *t*-ratios and *p*-values, which can be used to determine statistical significance).

It is worth remembering however that the concept of statistical significance says nothing about the size or practical significance of a coefficient. It could be, for example, that we can be very confident that a coefficient is not zero in the population, but it might nonetheless be small in practical terms and of not much relevance to policy. Alternatively, it could be that while a particular coefficient could be zero in the population, it is still the case that our best estimate is that the coefficient is large and of considerable relevance for policy.

For example, the results of Ssewanyana and Younger (2005) suggest that receiving professional prenatal health care increases the probability of infant survival by around 3 percentage points (see Box 2). This is quite a significant amount in practical terms, but it is not found by the authors to be statistically significant.<sup>7</sup> The conclusion should not therefore be that prenatal health care does not have an impact on infant survival; instead it should be that prenatal health care could have a large impact on infant survival, but that further research, and/or alternative sources of evidence, are required to pin down its effect more precisely.

Finally, two particularly relevant effects are the effects of a) price (or user fees) and b) household income on the use of relevant goods and services.<sup>8</sup> The effects of price play an important role in questions surrounding the appropriate level (if any) of user fees (see Section 3.2). The effects of income play an important role in questions surrounding the impacts of those government actions (e.g. infrastructure improvements) which raise levels of realisation of the right to health or education by raising income levels. Both are also important in any attempt to forecast future levels of use of a good or service (see Section 3.2).

Levels of household income (or expenditure) are reported in many household surveys, and this information can be used to estimate income elasticities of demand. If such information is not available, some proxy measure, such as household wealth or assets, can usually be used instead (see Section 4.1). Estimates of price elasticities can be more difficult to obtain from household-survey evidence, mainly because user fees are set at similar levels for most households. One alternative is to use more aggregated sources of information available over time. Another is to estimate price elasticities on the basis of responsiveness to the opportunity costs of accessing health and education services, such as the time spent travelling to and from the nearest school or health centre. Examples of studies using this latter approach are listed by Collier *et al.* (2002).

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<sup>7</sup> In this case, the most likely reason for the lack of statistical significance is the relatively small number of households in Uganda which do not make use of such care.

<sup>8</sup> These effects are referred to respectively as the price elasticity and the income elasticity of demand for a particular good or service.



### 3.1.5 *Averages versus disparities*

A danger when undertaking econometric analysis is that ‘averages hide disparities’ (Gibbons *et al.* 2005: 227): in other words, the effects being analysed may vary significantly from one group to another, and that ignoring this hides relevant information. We have seen that this danger can be offset, when analysing dichotomous health or education indicators, by plotting the estimated probability that a particular outcome is attained, or a particular service is used, for different levels of relevant explanatory variables. It can also sometimes be offset, when analysing continuous variables, by a suitable transformation of the dependent variable. For example, the effect of (additional) income on some health and education outcomes is often found to be much higher at lower levels of income than at higher levels of income; we can allow for this tendency by measuring income in logarithmic units.

Two other approaches can be used in the context of analysing both continuous and dichotomous indicators. The first is to split the sample into relevant sub-groups, estimating the regressions separately for each group. Gibbons *et al.* (2005), for example, estimate the determinants of school enrolment separately among boys and among girls. Among other things, this shows that the (generally negative) effect of child labour on school attendance is more severe for girls than it is for boys. The second method is to include interaction terms among the set of explanatory variables. An interaction term is simply two explanatory variables multiplied together; the term is included in the regression in addition to the two variables themselves. Doing this allows the researcher to estimate the extent to which the effect of one explanatory variable (e.g. household income) varies according to the level of another variable (e.g. location of residence).

### 3.1.6 *Potential sources of bias*

Another danger is that econometric techniques are based on a set of assumptions, and if these are violated the techniques will generate misleading or biased results. It is important therefore to establish the potential sources of such bias, and how they might be addressed. One potential source of bias is measurement error in the explanatory variables included in the regression. In practice, many of the explanatory variables used in econometric analysis are not ideal measures, but proxies: household assets as a proxy for household income for example, or a mother’s years of schooling as a proxy for her ability to acquire and use information on child health (Ssewanyana and Younger 2005). This introduces a source of error into econometric estimates which is generally of unknown size and direction.

Another potential source of bias is the omission of relevant explanatory variables, referred to as omitted variable bias. In practice, some of the variables known to affect health or education outcomes, or the use of health and education services, cannot be included in econometric analysis for reasons of data availability. If some of these variables not included in the analysis are correlated with variables which are included in the analysis, this will bias the results.

To give an example, a free school meals programme might be deliberately set up by governments in areas in which school enrolment rates are low. Comparing enrolment rates between areas with and without such a programme will give a misleading

impression of the amount by which a free school meals programme raises enrolment, since we cannot fully control for the reasons why the areas selected for the programme have lower enrolment rates in the first place. There are certain econometric techniques for dealing with these sources of bias (e.g. difference-in-difference estimation, used by Duflo 2001), which should be used whenever possible. Alternatives to econometric techniques, such as randomised evaluations (e.g. Kremer 2005), should also be used where available.

### *3.1.7 Identifying minimum essential levels*

This section shows how the analysis of health and education production functions can be used to shed light on the minimum essential levels of the rights to health and education. As discussed in Section 2, the minimum essential levels relate to whether a person has access to the goods and services which are essential for attaining key health or education outcomes. This section shows how we can identify such goods and services including, where relevant, their amounts. The process involves three main steps.

The first step is to specify the minimum acceptable level of attainment of a key health or education outcome. For dichotomous outcomes, this can be considered a sufficiently high level of probability (e.g. 95%, 99% or even 100%) that the outcome is attained. For continuous outcomes, it can be considered to be a sufficiently high expected level of the outcome in question (e.g. a life expectancy of at least 40 years). The precise levels will vary according to the outcome under consideration and country circumstances. For instance, while the minimum acceptable level of literacy might be considered to be 100%, the minimum acceptable level of child survival might be considered to be slightly lower (e.g. 99.5%), since some child deaths may occur for reasons which are unavoidable, or at least beyond the realm of public action.

The second step is to estimate each individual's expected level of attainment in the health or education outcome being considered. This will depend on the goods and services that a person uses and the quality of those services, as well as certain demographic characteristics (e.g. age, gender). These estimates can be derived from the results obtained from the regression analysis of health or education production functions. (More specifically, they are the predicted values of the dependent variable generated by the regression; these will be generated automatically by any standard piece of econometric software).

The third step is to identify any goods or services (including, if relevant, their amounts) which appear to be both necessary and sufficient for a person to attain the minimum acceptable level of attainment. By necessary, we mean that all persons who do not use the good or service (or who do not use a certain amount) do not attain the minimum acceptable level. By sufficient, we mean that all persons who do use the good or service (or who do use a certain amount) do attain the minimum acceptable level. These goods and services (and, if relevant, their amounts) can then be referred to as goods and services which are essential for attaining the health or education outcome in question.

For a simple illustration of this procedure, consider Table 3.1. This table shows the proportion of people in Uganda (in 2000) who are literate (defined as being able to

read and write), according to their highest level of completed schooling, and the proportion who are not. The data are taken from the Uganda National Household Survey of 1999/2000. The percentage values in the middle column of the table can be interpreted as the estimated probability that an individual with a certain level of completed schooling will be literate. Therefore, if we specify a minimum acceptable probability of being literate of 95%, the minimum essential level of schooling would be five completed years. The reason is that among people with at least five years of schooling, the estimated probability of being literate is greater than 95%. Alternatively, if we specify a minimum acceptable probability of 99%, the minimum essential level of schooling is six completed years. The reason in this case is that among people with at least six years of schooling, the estimated probability of being literate is greater than 99%.

**Table 3.1 Literacy and schooling in Uganda, 1999/2000**

<b>Years spent in school</b>	<i>Able to read and write (%)</i>	<i>Not able to read and write (%)</i>
<i>No formal education</i>	1.4	98.5
<i>Not completed 1 year</i>	4.2	95.8
<i>1 year completed</i>	13.5	86.5
<i>2 years completed</i>	41.1	58.9
<i>3 years completed</i>	71.3	28.7
<i>4 years completed</i>	93.0	6.9
<i>5 years completed</i>	98.2	1.7
<i>6 years completed</i>	100.0	0.0
<i>&gt;6 years completed</i>	100.0	0.0

*Source:* National Household Survey of Uganda, 1999/2000

Certain aspects of the procedure are worth noting. First, in most cases it should be done separately for different groups in the population (e.g. men and women, rural vs. urban areas). This is to the extent that there are differences across groups in the effect of a particular good or service on the probability that an outcome is attained. It might, however, be considered impractical to carry out the analysis for a very large number of different groups.

Second, the proposed approach shares much in common with standard World Health Organisation (WHO) approaches to estimating minimum energy and protein requirements. In cases when there is only one variable affecting the probability that a particular outcome is contained, and that variable is continuous, the approach proposed here is identical to the WHO approach to calculating recommended levels of protein intake. It differs, however, from the WHO approach to calculating energy requirements, which are calculated in such a way that approximately 50% of individuals (in a given group defined by age, gender and/or body size) will have needs above the required level, and approximately 50% will have needs below the required level. (For a description of the WHO approaches, see Beaton 1981).

Third, note that (as with the WHO approach) there may be some individuals who, despite using an essential good or service (or amount thereof), still do not attain a

particular outcome. This is because at least some reasons for lack of attainment may be considered beyond the realm of public action. Finally, the procedure is based on a prior definition of both a) key health and education outcomes, and b) minimum acceptable levels of attainment in these outcomes. How one might go about establishing these outcomes and levels is a crucial question, but it is not addressed in this paper and instead left open for further discussion.

Certain drawbacks with this proposed approach should also be noted. First, it requires that the minimum acceptable level has been attained by at least some groups/individuals. If it has not, it is not possible to say from household survey evidence which goods and services (or amounts thereof) are necessary or sufficient for attaining an outcome; an alternative approach is required. Second, it may be difficult to estimate the relationship between health inputs and outcomes very accurately, leading to uncertainty about the precise combination of inputs that is necessary or sufficient. For these last two reasons, alternative approaches to identifying essential goods and services are discussed in Section 5.

### *3.1.8 Measuring levels of disadvantage*

As discussed in Section 2.2, assessing whether one group can be considered more or less disadvantaged than another plays a key role in monitoring compliance with the third and fourth requirements of governments' obligations under the ICESCR. By level of disadvantage of a group, we refer either to the levels of realisation of each of the rights set out in the ICESCR among that group, or if the minimum essential levels of each right have not yet been attained, the extent of its attainment of these minimum essential levels.

When defined in this way, it will not generally be possible to provide a complete ranking of groups in society by levels of advantage. This is for reasons which have been discussed extensively in the literature (see for example Sen 1999: 76-81). In particular, given that there are various different rights there may well be several pairs of groups, where one group has a higher level of realisation of one right and the other group has a higher level of realisation of another right. Such pairs of groups cannot be ranked, unless specific normative parameters (or weights) are attached to the level of realisation of each right.

This is not to say, however, that no rankings of groups are possible. Instead, there may be some groups which have lower levels of realisation of all rights than other groups. For this reason, it will generally be possible to provide a partial ranking: in other words, at least of some groups which can be said to be more disadvantaged than at least some other groups. A simple hypothetical example is shown in Table 3.2 below. Three groups in a country are defined (A, B and C), and the table shows the level of realisation in each group in each of three rights: health, education, and living standard.

**Table 3.2 Partial ranking: a simple hypothetical example**

Group	Right to health	Right to education	Right to adequate living standard
A	1	2	1
B	2	1	3
C	3	3	2

The numbers in the table are rankings, with 1 indicating the highest level of realisation and 3 indicating the lowest level of realisation. In this case therefore, it is not possible to say whether group A is more or less disadvantaged than group B: it is less disadvantaged in terms of health and living standard, but more disadvantaged in terms of education. Similarly, it is not possible to say whether group B is more or less disadvantaged than group C: it is less disadvantaged in terms of health and education, but more disadvantaged in terms of living standard. However, it is possible to say that group C is more disadvantaged than group A: it is more disadvantaged in terms of health, education and living standard.

These forms of partial group rankings can be constructed using information on levels of realisation in each of the rights set out in the ICESCR, which can be estimated using household survey data. They make it possible to assess whether or not governments are complying with the principles of non-discrimination and equality.

### 3.2 *Identify and cost policy options*

The second stage of the methodology is to identify government actions which could raise levels of realisation of the right to health or education, and/or attainment of the minimum essential levels of these rights, and estimate their likely costs.

Identifying potential government actions can be done using the results of the first stage of the methodology. These results indicated which access factors and quality indicators affect the use of relevant goods and services and/or attainments in key health and education outcomes. A potential government action must bring about a desirable change in at least one access factor or quality indicator which is found to raise the use of at least one good or service which raises attainment in at least one health or education outcome. Some examples are provided in Table 3.3.

It is important to stress that the aim is not to prescribe specific actions which must be taken by the government. Instead, the aim is to outline at least one action that a government could take (but is not currently taking), and to investigate its cost. This is a step towards assessing whether the action would – taking everything into account, including the implications of raising the required revenue – raise the level of realisation of the right to health or education, and/or of attainment of the minimum essential levels of these rights. In principle, there may be several actions which meet this criterion, and although the government would be required to take one of these actions, it would not be required to take any one in particular.

It is worth noting that potential actions could include direct government actions to raise access to health and education (e.g. reductions in user fees) as well as more

indirect actions (e.g. rural infrastructure improvements), which raise levels of realisation by raising income levels.

**Table 3.3 Potential government actions to raise realisation of rights to health and education**

<b>Access factor</b>	<b>Potential government actions</b>
Household income or wealth	Provide income transfers; reduce user fees; rural infrastructure improvements
User fees	Reduce user fees; provide income transfers
Distance to nearest school/health centre	School/health centre building programme; transport improvements
Literacy rates among parents	Adult literacy programme; make use of children's health services compulsory
Gender or ethnicity	Enforced equal opportunities legislation; affirmative action
<b>Quality indicator</b>	<b>Potential government actions</b>
Teacher-pupil ratios	Employ more teachers; raise teacher salaries
Availability of medical equipment	Purchase more equipment; subsidise private health care/insurance

*Notes:* This list is not meant to be exhaustive, and can be expanded through consultation with health and education experts, and through systematic reviews of the policy literature.

Once a potential action has been identified, estimates of its likely effect on relevant access factors and/or quality indicators should be provided. In many cases, such estimates can be calculated without difficulty. For a school building programme, for example, it is straightforward to calculate the reduction in distances children have to travel to their nearest school, given information on where the new schools were to be built. Similarly, Collier *et al.* (2002) estimate that in Ethiopia, a 1% increase in the number of primary health care centres would reduce the average distance required to travel to those centres by around 0.5%. They also note that 'in any particular local situation...the relation between the number of facilities and the mean distance to a facility is a simple matter' (*ibid.* 444).

In some cases, however, additional analysis may be required. For example, estimating the impact of infrastructure improvements on household income first requires an analysis of household income (or profit) functions. A recent illustration of how this can be done, using household survey data for Vietnam, is provided by van de Walle and Gunnewardena (2001).

Once a potential government action has been identified, and its impact on access factors calculated, the next step is to estimate the revenue requirements of the action. Here, the methods involved will depend very much on the type of action being considered. The next sub-sections (Sections 3.2.1–3.2.5) outline the main steps required for five types of actions: a) additional provision of public health or education services, b) changes in user fees; c) provision of cash or in-kind transfers, d) (additional) subsidies for private health and education services, and e) legislative measures.

### 3.2.1. *Public provision*

Government actions under this heading are designed to increase the accessibility and/or quality of publicly-provided health or education services. Costing such actions involves five main steps.

The first is to specify the additional inputs to be purchased by the government. These will depend very much on the service being provided, but are likely to include capital (e.g. new school buildings, desks, medical equipment), labour (e.g. teachers, training of medical staff), and materials (e.g. additional text-books, drugs and vaccinations). Some of these will have to be purchased on a regular basis (e.g. teachers, drugs and vaccinations), representing current expenditure, while others have to be purchased more infrequently (e.g. new school buildings), representing capital expenditure. Some inputs may also have to be purchased in specific combinations (e.g. different types of drugs used to treat HIV patients).<sup>9</sup>

The second step is to obtain information on the prevailing prices of each of the inputs to be purchased. These include, for example, prevailing teachers' salaries, the prices of drugs and vaccinations, the prices of materials necessary for building a new school, and so on. Different sources of this type of information are discussed in Section 4.2. For inputs which have to be purchased on a regular basis, it is also necessary to estimate likely ranges of these prices in future years (e.g. likely trends in teacher salaries). For inputs which only have to be purchased infrequently, it is possible to calculate an annualised price on the basis of the prevailing rate of interest.

The third step is to calculate the total cost of the additional inputs to be purchased over some period of time (e.g. 5–10 years). Ideally, this would take into account the potential effects of the additional government purchases on the price of each input. This is difficult, however, and requires estimates of the elasticity of demand and supply for each input purchased. However, if additional government purchases represent a relatively small proportion of the existing supply of each input, it is reasonable to assume that any such effects will be small. In this case, the total cost of the additional inputs can be approximated by multiplying the additional amount of each input to be purchased in each year by the expected price of each input in each year, and then averaging over the period being considered.

The fourth and final step is to subtract any costs which are to be recovered by the government through user fees attached to the service. The sum of costs recovered in this way will be equal to the additional number of users of the service resulting from the additional level of provision, multiplied by the user fee charged for the service in question. The additional number of users likely to arise from the government action

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<sup>9</sup> More generally, it is possible to think of a particular health or education service being provided according to a standard production function. The form of this function will differ according to the type of service being provided; in some cases, there may be substantial substitutability between different inputs (e.g. labour, capital, different types of materials), while in others there may be very little substitutability. The minimum cost of providing a particular level of service will be determined by the prevailing prices of the inputs, and the level of technology (also summarised by the production function). The production function may also be subject to economies of scale, in which case average minimum costs will decline as output expands. Actual costs may be somewhat above the minimum levels however, perhaps due to the absence of competitive pressures in the public sector.

(i.e. from the additional provision) can be estimated using the results of the demand-function analysis carried out in the first stage of the methodology.<sup>10</sup>

### 3.2.2 *Changes in user fees*

Government actions under this heading involve changing the fees which are charged to users of existing public goods and services. Costs arise whenever user fees are reduced, particularly if user fees are eliminated altogether.

Estimating the costs of reductions in user fees is fairly straightforward if we assume that the government makes no adjustment to the level of provision of the good or service in question. In this case, the cost is given by the size of the reduction in the user fee, multiplied by the number of users currently paying the fee. However, it is likely that a reduction in user fees will encourage more users of the good or service, and in the absence of any other adjustment on behalf of the government, this may well lead to a reduction in the quality of the good or service being offered.

To give a simple example, if a government abolishes user fees for education without employing more teachers, it is likely that pupil-teacher ratios will rise, lowering the quality of education. This needs to be taken into account when considering the overall effect of abolishing user fees.

For this reason, an alternative approach is to base the costing on the assumption that, at the same time as reducing user fees, the government also adjusts the level of provision of the service. The overall cost of the action in this case is given by the sum of two components. The first is the cost of the reduction in the user fee, equal to the reduction in the user fee multiplied by the existing number of service users. The second is the cost of the additional provision made available, which is estimated using the approach outlined in the previous sub-section.

### 3.2.3 *Transfers*

The third case to consider is when the government step or action involves a cash or in-kind transfer. The revenue requirements of a transfer will equal the number of transfers made available (in other words, the size of the eligible population), multiplied by the amount of the per person (or household) transfer in financial terms. For in-kind transfers, the latter is simply the value of the in-kind transfer in units of local or international currency.

In determining the revenue requirements, a government will typically need to work on the assumption that all eligible households will in fact take up the transfer. In practice, take-up rates are often much lower than 100%, which will lower the impact of transfers on key welfare outcomes. One might therefore need to include estimates of the cost of raising take-up rates (e.g. a rural outreach service) in the costing exercise.

The revenue costs of a transfer are likely to vary over time in response to changes in the size of the eligible population. Estimating revenue requirements in future years

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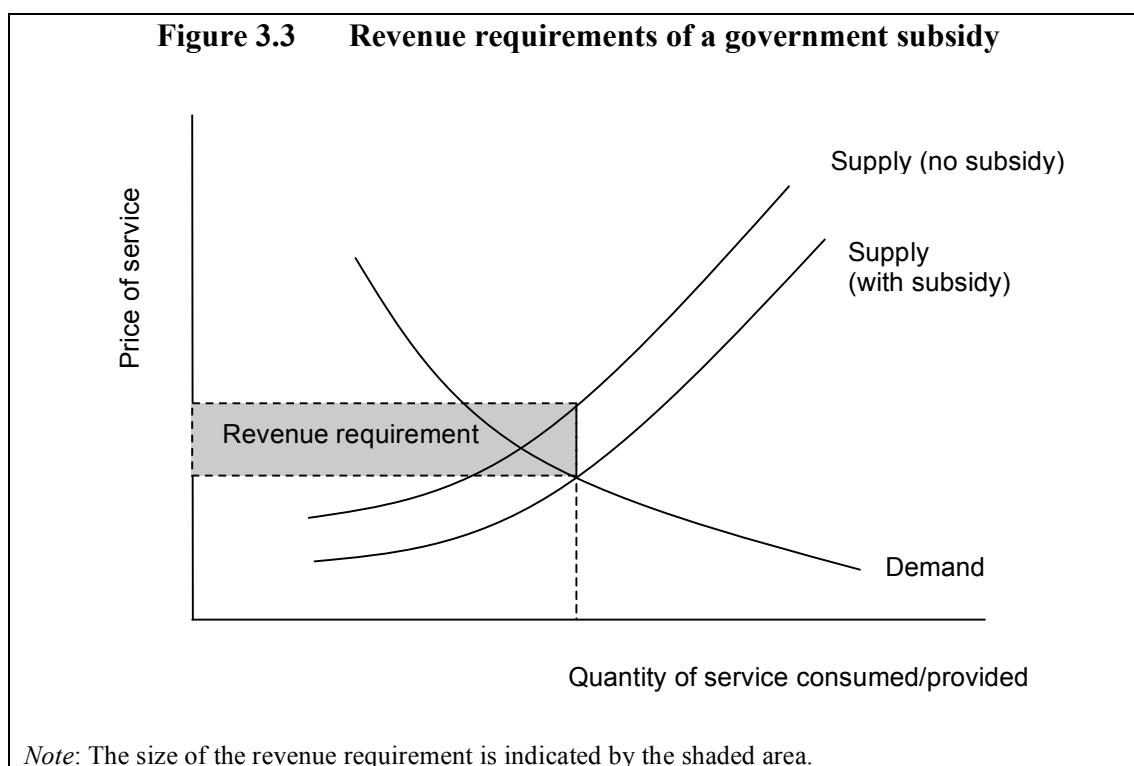
<sup>10</sup> The exception is if the service being provided is entirely new. In such cases it will not be possible to forecast demand on the basis of quantitative analysis; alternative sources of evidence must be used. This is discussed further in Section 5.



requires therefore making certain assumptions about demographic trends (e.g. from UN population projections, available at <http://esa.un.org/unpp/>). One would also expect there to be administration costs (including monitoring and evaluation) in operating a transfer programme, which would be higher for targeted, means-tested or conditional programmes than for universal or unconditional programmes. Evidence from recent conditional cash transfer programmes in Latin America suggests that administration costs represent between 10 and 20% of the total costs of such programmes.

### 3.2.4 Subsidies

The next case to consider includes actions which involve subsidising private health or education services. The revenue requirements in this case are equal to the level of demand for the service in question, at the new subsidised price, multiplied by the per unit subsidy (see Figure 3.3).<sup>11</sup> The level of demand at the new subsidised price cannot be known before the subsidy is set, and must instead be estimated. In principle, this can be done using information on the elasticities of demand and supply for the service in question, although obtaining such estimates can sometimes be difficult. For relatively small subsidies, however, it is reasonable to assume that the use of the service at the new subsidised price will be close to the existing level of use. In this case, the overall revenue requirements can be estimated by multiplying the existing level of use of the service by the per unit subsidy.



As with transfers, the revenue requirements of a government subsidy are likely to vary over time, mainly in response to shifts in the demand and supply of the service being subsidised. Higher levels of demand, due to population growth or demographic

<sup>11</sup> The analysis is identical when the government step or action involves a rise in the level of an existing subsidy on a good or service, rather than the introduction of a new subsidy.

change for example, tend to raise the cost of a subsidy. Assumptions are therefore required about trends in population growth, economic growth and demographic change, and their likely impacts on demand. The former can be obtained from sources such as UN population projections or World Bank economic growth projections, while their likely impacts on demand can be inferred from the analysis of the health or education demand functions, and estimates of income elasticities of demand in particular (see Section 3.1.4).

### 3.2.5 *Legislative measures*

The final case to consider is where the government action involves a legislative measure (e.g. making primary education compulsory, prohibiting the paid employment of children below a certain age, equal opportunities legislation, and affirmative action). As argued in Section 2.3, such measures are unlikely to be very effective unless enforced, and enforcing the legislation is likely to have revenue requirements. These requirements may include:

- inspection costs, e.g. inspecting communities for children not enrolled in primary school, firms for employment of children below a certain age, or firms for compliance with employment quotas;
- judicial costs, e.g. salaries of judges required to adjudicate on equal opportunity cases brought to court;
- punishment costs, e.g. imprisonment of persistent offenders (although if fines are used, these will represent revenue gains to the government, i.e. negative costs).

Estimating the likely size of these sorts of costs is difficult, but the basic approach is the same as costing the provision of public health or education services (Section 3.2.1). (This should not be surprising, since enforcing legislation is simply the public provision of another service, that of law and order.) In particular, the first step is to specify the additional inputs to be purchased (e.g. inspectors, judges, courts); the second is to obtain information on the prevailing prices of these inputs (e.g. judges' or inspectors' salaries); the third is to estimate the total cost of the additional provision, under the assumption that the prevailing prices do not change very much in response to the additional government purchases, and the final step is to subtract any cost recovery.

### 3.2.6 *Recent examples of costing exercises*

A large number of costing exercises of government health and education programmes have been carried out in the recent past. Some of the earliest examples are in Streeten (1981), including an estimate that 'primary health care for all need not cost more than \$2.50 to \$4 per person a year' (*ibid.*:132). Some more recent examples are described in Box 3. These range from back of the envelope calculations done by Glewwe and Zhao (2005) and Miguel and Kremer (2004), to estimates using national-level public expenditure data by Colclough and Al-Samarrai (2000) and Collier *et al.* (2002), to the more detailed and comprehensive analysis provided by Kombe and Smith (2003). Clearly, the more time and effort is put into the exercise, the more accurate a costing

estimate will be, and the narrower the margin of uncertainty about the true costs. In some cases however, even a rough estimate (i.e. one accompanied by a wide margin of uncertainty) can be sufficient. This is discussed further in Section 5.

There has also been a recent resurgence of costing exercises in the context of the Millennium Development Goals (MDGs). Many of these exercises are designed to estimate the cost of achieving universal use of a particular service (e.g. universal primary school enrolment, universal basic health care) by 2015. The majority of these use a unit-cost approach. Broadly speaking, this involves first dividing total public expenditure on a particular health or education service by the number of current users, and then multiplying this amount by the number of additional users required to ensure universal use of the service. The total obtained is then taken to be the additional expenditure required to ensure universal use of the service.

It is important to note that the approach proposed in this stage of the methodology differs from an MDG-costing exercise. In particular, it does not involve estimating the cost of achieving universal use of a given health or education service. Instead, it involves estimating the costs of government steps towards universal access to (or use of) a particular service. This is a much more manageable task than an MDG-costing exercise. The exception would be if a country was already quite close to universal use of a given health or education service, in which case a step towards universal use of or access to a service would in fact achieve universal use or access.

Furthermore, the types of actions to be costed are based on an analysis (as set out in Section 3.1) of the reasons for low levels of access to (or use of) the service in question. This addresses one of the main criticisms of the MDG-costing exercises, namely that they make little attempt to determine what policy changes would in fact bring about a rise in the use of the health or education service being costed. As noted by Glewwe and Zhao (2005), for example:

‘most existing [education costing] studies implicitly assume that the main barrier to [achieving universal primary education] is lack of schools and teachers, which is why their cost estimates focus on building more schools and hiring more teachers. Yet there is ample evidence that many parents choose not to send their children to the schools currently available’ (Glewwe and Zhao 2005: abstract).

Of course, other criticisms of MDG-costing exercises have also been made. These include the assumption that unit costs remain constant as coverage expands, and the use of estimates from a small number of countries to obtain global estimates. The approach proposed here is not subject to the latter criticism however, since no global level costing is attempted. It is also less subject to the former criticism, mainly because it focuses on the costing of specific government steps designed at raising coverage rather than the costing of achieving universal coverage. In addition, the potential for economies or diseconomies of scale can be investigated in each particular context and incorporated into the estimates if necessary.

### Box 3 Examples of costing exercises related to education and health

1. Evaluations of a pilot conditional cash transfer (CCT) programme in Nicaragua suggest that it increased primary school enrolment rates by around 15 percentage points and completion rates by around 25 percentage points (Glewwe and Zhao 2005). The size of the transfer paid to households was about \$112 per child per year. Scaling up such a programme to the 150,000 Nicaraguan children thought to benefit most from such a programme implies an annual revenue requirement of about \$17 million, not including administration costs. The latter would need to be estimated separately, but it is unlikely that these would add more than an additional 10-20% of the \$17 million figure.

2. Evaluations of school-based health programmes (e.g. de-worming) have shown that they can have significant impacts on child health and enrolment in school (e.g. Miguel and Kremer 2004). On the basis of recent large-scale government programmes in Ghana and Tanzania (PCD, 1999), it has been estimated that the total financial cost of a de-worming programme is around US\$0.5 per pupil treated per year.

3. Colclough and Al-Samarrai (2000) estimate the unit cost of publicly funded primary education in 27 countries in Sub-Saharan Africa, in or around 1990. This is done by dividing total public recurrent expenditure on primary education by the total number of pupils enrolled in school, with data in each case obtained from the UNESCO Statistical Yearbook. They show that these unit costs differ significantly across African countries, with a general tendency for unit costs to be higher where teacher salaries are higher. Ethiopia stands out as having particularly high unit costs of public primary education.

The authors also estimate the additional cost of achieving universal primary enrolment for the 19 countries which had not, in 1990, already achieved this. This is estimated by multiplying the unit cost by the total number of children of primary school age not enrolled in school. The costs are found to be quite low (around 1% of GDP) in the low unit-costs countries, but much higher (around 4% of GDP) in countries with higher unit-costs. The estimates are based on the assumptions that:

- unit costs will remain the same as enrolment expands;
- the school age population remains constant over time;
- the main constraints to expanding enrolment are on the supply-side: in other words, that providing more school buildings, teachers, desks, textbooks and so on will bring about the desired increase in enrolment.

4. Collier *et al.* (2002) look into the likely costs of expanding the quantity and/or improving the quality of public primary health care (PHC) in Ethiopia. On the basis of information reported in World Bank and Government of Ethiopia Public Expenditure Reviews, they estimate that total public recurrent expenditure on PHC amounted (in 1997) to 138 million birr.

They also estimate that off-budget expenditure – mainly by aid donors and non-governmental organisations, particularly on drugs and medicines – accounted for a similar amount (after netting out the costs recovered through user charges for those drugs and medicines), giving a total estimated expenditure of 276 million birr. This was divided between 2,010 PHC centres, so that the average recurrent cost of each centre was 137,300 birr. (This refers to a centre of average quality; the authors found a large amount of variation in the quality of PHC centres across the country).

[continued on next page]

Collier *et al.* (2002) also estimate, on the basis of figures contained in the Ministry of Health's planning documents, that the cost of constructing a new PHC centre is 1.5 million birr. Assuming a discount rate of 10%, this represents an annual cost of 30,000 birr, so that the total annual cost of a PHC centre (of average quality) was 167,000 birr. A 10% increase in the number of PHC centres (i.e. around 200 new centres) would therefore cost around 33 million birr per year.) For a comparison, they estimate that improving the average quality of existing PHC centres would require an additional 46 million birr per year.

The main conclusion of the study was that reallocation of health expenditure away from building more PHC centres and towards raising the quality of existing centres, would increase the number of visits to health centres, with beneficial impacts on health outcomes.

The authors recognise that their cost estimates, which are all based on national-level data, provide a crude approximation only, and any conclusions drawn are as a result based on 'heroic assumptions' (ibid.: 446). Instead, local cost information will always be preferable: 'information at the level where [budgeting] decisions are routinely made will always be superior to these national-level data' (ibid.: 443). Moreover, they also argue that there is nothing 'intrinsically difficult' about estimating such costs on the basis of local information.

5. During 2002, the government of Zambia proposed to provide free antiretroviral (ARV) treatment to around 10,000 people living with HIV/AIDS, out of a total of around 100,000 people thought to be clinically eligible for such treatment. Kombe and Smith (2003) estimates the likely cost of providing such treatment.

They identified the main costs of the programme to be: capital costs (testing equipment, vehicles), labour costs (training of health care workers), drug costs (e.g. lamivudine, nevirapine) and monitoring/test costs (e.g. viral load tests). Building and staff costs were excluded, on the grounds that these would be funded by the government in the absence of the policy. (The opportunity costs of using up building space and staff time for ARV treatment were recognised, but not incorporated into the calculations).

The cost estimates were drawn from various sources, including consultation with experts (training needs), official sources (drug and test-kit prices). They also added, as a general rule of thumb, around 15% for storage, distribution and waste of drugs and test kits.

Access to the programme was based on a voluntary counselling and treatment (VCT) service offered at certain areas/hospitals in the country. The authors recognised that it was difficult to forecast what proportion of individuals would take-up VCT services (i.e. the demand for such services), and of those, what proportion would qualify for ARV treatment.

The main findings of the study were as follows:

- the total financial cost was estimated at \$4.9 million per year, or \$490 per person treated;
- there was a trade-off between the number of people of treated and the quality of treatment offered to each person treated (e.g. by varying the type of treatment drugs prescribed, and the range and frequency of monitoring tests given);
- cost-sharing would also raise the number of people who could be treated (e.g. by requiring those people above a certain income level to contribute 20% of the drug costs);
- the current level of provision (10,000 people) was thought to be affordable, although only if current donor resources continued (which was uncertain); achieving universal free access to such treatment was considered to be completely unaffordable.

### 3.2.7 *Non-financial costs*

This final sub-section discusses the likely non-financial costs of government actions. The costing analysis outlined so far relates entirely to the financial costs of a government action. These determine the amount of revenue which must be raised to finance the action, which in turn has an important bearing on the overall effects of the action (as discussed in the next section). However, it is important to recognise that a government action may also have non-financial costs. These might include, for example, the additional time taken by voluntary community labour to build new schools, or the additional time burden placed on health workers having to run a health programme. In fact, a government may actively seek to reduce the financial costs of an action by raising these sorts of non-financial costs.

For this reason, it is important to determine whether any non-financial costs arising from a potential government action are sufficiently large to undermine the positive effects of the action, or to conflict with other economic and social rights. For example, it could be that an obligation on community members to participate in a school building programme prevents them from attaining an adequate standard of living, or that an obligation on health workers to provide additional HIV/AIDS counselling and treatment services prevents them from providing other essential services. If such cases, the action needs to be reformulated in a way that reduces these nonfinancial costs (e.g. hiring more contract labour for school building). This typically involves raising the financial costs and therefore the revenue requirements of the action.

### 3.3 *Assess revenue constraints*

The third and final stage of the methodology is designed to assess the potential revenue constraints facing a government. As discussed in Section 2.5, the proposed approach involves a series of three rules of thumb. These are outlined in Sections 3.3.1 to 3.3.3 below. A final sub-section (3.3.4) compares the proposed approach with existing approaches to assessing the affordability of government programmes in health, education and certain other areas (e.g. social protection).

The analysis in this stage will depend on the source through which government revenue is to be raised. An important preliminary step is therefore to identify and state this source, which could be any one of the four main sources outlined in Section 2.5. In doing so, it must also be demonstrated that there is sufficient capacity to raise the required revenue from the specified source(s). Thus if the revenue source is a reallocation of expenditure, the items of expenditure to be reduced (e.g. defence) must be sufficiently large to finance the required action. Alternatively, if the revenue source is domestic taxation, it must be possible to raise additional tax revenue without reaching the point at which higher tax rates actually reduce the amount of revenue raised. Similarly, if the source is foreign aid or borrowing, it must be the case that the government can reasonably expect sufficient flows of aid, or that the government has access to international credit markets.

A government's capacity to raise revenue can be assessed in various ways. One way is to look at existing levels of expenditure across sectors, as documented in national budget documents or in international sources such as the IMF publication *Government*

*Financial Statistics.* Another is to look at the existing levels of tax rates and any information on the elasticities of supply and/or demand for the goods and services to be taxed. (The lower the initial tax rates, and the lower the elasticities of supply and/or demand, the more likely it is that sufficient additional revenue can be raised). A further option is to look at a country's eligibility for non-concessional assistance from multilateral development banks such as the World Bank.

The main thing to remember is that even if the government has the capacity to raise the revenue requirements of an action, this does not necessarily imply that the action should be taken. Instead, it is necessary to establish whether any adverse effects of raising the revenue are sufficiently large to offset the positive effects of the expenditure itself. This is the main aim of the third stage of the methodology, and it is assessed using the three rules of thumb introduced in Section 2.5.

### 3.3.1 Overall effects, short-run

The first rule of thumb is designed to assess whether the overall effect of the potential government action would be to raise levels of realisation of the right to health or education in the short run. By the overall effect, we mean taking into account both the positive direct effects of the government action as well as any negative indirect effects arising (in the short run) from raising the necessary revenue. By the short run, we mean over a time period of around one to five years.

We first outline the case where revenue is to be raised through a reallocation of expenditure. In this case, the basic approach is to estimate the effect of government expenditure in two different sectors on the level of a relevant health or education indicator (either an outcome indicator or a use indicator). As shown in Figure 2.1, this overall effect can be decomposed into two separate effects, namely a) the effect of each access factor and/or quality indicator on the health or education indicator, and b) the effect of government expenditure on the level of each access factor and/or quality indicator.

Estimates of the first of these effects are derived from the first stage of the methodology, while estimates of the second are derived from the second stage. As an illustration, consider a simple example. Imagine that (from the first stage of the methodology) a 10% reduction in distance to school is estimated to raise school enrolment rates by 20%. Imagine further that (from the second stage of the methodology) it is estimated that a school building programme which reduces distance to school by 10% costs the government \$10,000. Now imagine that (from the first stage of the methodology) a 5% reduction in household income is estimated to reduce school enrolment rates by 5%, while it is estimated (from the second stage) that cutting back expenditure on an irrigation programme by \$10,000 would reduce household income by 5%.

Once these two effects have been estimated, the rule of thumb can be applied. In particular, if the effect of government expenditure in the two sectors is found to be very different, the government could attain a higher level of the health or education indicator simply through a reallocation of existing expenditure. In the above example, a reallocation of \$10,000 of government expenditure from irrigation to school building would raise the enrolment rate.

The precise calculations underlying this procedure, including their extension to the case of taxation, are set out in Appendix 5. Of course, care is needed in interpreting the results. First, they ignore the possible effects of an expenditure reallocation or rise in taxation in the medium to long run, and for this reason represent only one of three steps for assessing revenue constraints. Second, the results may differ according to the precise health or education indicator being analysed, so the sensitivity of results to different indicators should be explored.

### *3.3.2 Overall effects on economic growth*

The second rule of thumb is designed to assess whether the overall effect of a potential action would raise or reduce economic growth. As discussed in Section 2.5, important considerations in this context are a) the likely short-run effect of the government action on health and education indicators known to affect economic growth, b) the size of the (positive) effect of those indicators on economic growth, and c) the size of any negative effects of raising the required revenue on economic growth.

The likely effect of the government action on health or education in the short run can be estimated using the procedure underlying the first-rule of thumb. The likely effect of improvements in health and education on subsequent economic growth can be assessed by referring to the cross-country econometric evidence on the determinants of economic growth. This literature provides quantitative estimates (and associated confidence intervals) of the amount by which different health and education indicators (e.g. infant and child mortality, average years of schooling) affect subsequent economic growth. According to one authoritative study (Barro and Sala-i-Martin 2005) for example, an increase in life expectancy (at age one) of five years would be expected to raise subsequent economic growth by close to one percentage point per year. This and other potential sources of such estimates are discussed further in Section 4.3.

Finally, the likely effect of raising the revenue requirements can also be assessed by referring to the cross-country econometric evidence on the determinants of economic growth. This provides estimates of the effect of higher government revenue on economic growth, controlling for other influences on growth.<sup>12</sup> This literature also provides estimates of the effect of macroeconomic stability (e.g. lower rates of inflation, smaller budget deficits) on economic growth, which is a relevant consideration if revenues are raised through government borrowing, and of international aid (see again Section 4.3). In some cases (e.g. if revenue is raised by tackling corruption and leakage) one could plausibly argue there would be little effect on growth, or even a positive effect.

On the basis of these three sets of evidence therefore, it is possible to provide an assessment of the likely impacts of a potential government action on economic growth. The precise calculations are set out in Appendix 6. The same three sets of evidence can also be used to assess effects on other important intermediary variables.

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<sup>12</sup> According to the results of Barro and Sala-i-Martin (2005) for example, a rise in the ratio of government revenue to GDP of five percentage points would be expected to reduce economic growth by around half a percentage point per year (see Section 4.3).



One such variable might be the supply of trained teachers and/or health workers, which could be affected if the revenue requirements of a government action were raised through a reduction in government expenditure on tertiary education. A reduction in the supply of such workers could make achieving universal primary education and health care in future years much more difficult.

In this case, the first stage is to assess the likely effect, in the short-run, of the government action on any health or education indicators (e.g. primary and secondary enrolment and completion rates) shown to influence the supply of trained teachers and/or health workers in future years. The second stage is to assess the effect of improvements in health and education indicators on the supply of trained teachers and/or health workers in future years. For example, the number of children currently enrolled in primary and secondary school may raise the supply of trained teachers in future by raising the number of people acquiring the necessary level of schooling to enter tertiary education. Once again, the magnitude of this effect can in principle be estimated using empirical evidence.

The third stage is to assess the effect of lower tertiary education expenditure on the supply of trained teachers and/or health workers in future years. This effect would be expected to be negative, since the reduction would tend to raise the private costs of tertiary education, leading to a reduction in the number of newly-trained teachers and/or health workers entering the labour force each year. In principle, the magnitude of this effect can be estimated using empirical evidence (although if such estimates are not available in the existing literature, further research would be required).

On the basis of these three sets of evidence, therefore, it is possible to provide an overall assessment of the likely effect of a government action on the supply of trained teachers and/or health workers in future years. This is again based on relatively simple rules of thumb as opposed to a detailed and complex economic model.

### *3.3.3 Overall assessment*

The third rule of thumb is designed for cases in which a potential government action is estimated to raise levels of realisation of the right to health or education in the short run, but to reduce either economic growth or growth in some other important intermediary variable (e.g. the supply of trained teachers or health workers). In particular, it is designed to assess whether the reduction in economic growth, or in any other important intermediate variables, is sufficiently large to offset the positive short-run effect of the potential action.

As discussed in Section 2.5, application of this rule of thumb requires considering a) the likely overall effect of the government action on realisation of the right to health and education in the short run; b) the overall effect of the government action on economic growth, or on any other important intermediary variables, in the medium to long run; and c) the effect of economic growth, or of any other important intermediary variables, on future levels of realisation of the right to health and education.

The overall effect on realisation of the right to health or education in the short run is assessed using the first rule of thumb, while the overall effect of economic growth (or any other important intermediary variables) is assessed using the second rule of

thumb. The likely impact of economic growth on future levels of realisation can be assessed using econometric estimates of the amount by which different health and education indicators are affected by economic growth (or any other important intermediary variables). Sources of such estimates are discussed in Section 4.4).

On the basis of these three sets of evidence, therefore, it is possible to provide an overall assessment of the likely impacts of a potential government action on levels of realisation of the right to health or education over the medium to long term as well as the short term. The precise calculations are set out in Appendix 7.

## 4 Variables and indicators

This section discusses the different sorts of variables and indicators which can be used in implementing the methodology.

### 4.1 Types of health and education indicators

In Section 3.1, five types of health and education indicators are defined, namely:

- key health and education outcomes;
- the use of relevant goods and services;
- the quality of those goods and services;
- the access factors which affect the use of relevant goods and services.

In this section we now discuss these indicators in more detail and describe some of the sources from which they can be obtained.

#### 4.1.1 Key health and education outcomes

Key health and education outcomes are considered by the ICESCR, and the human rights movement more broadly, to be of intrinsic value in and of themselves. This is the case even though they may also have instrumental importance (e.g. contributing to people's productivity), and reinforce each other (e.g. better education leading to better health and vice versa).

Examples of commonly-available outcome indicators are shown in the upper panel of Table 4.1. For education, they include literacy status and student test scores. For health, they include infant and child mortality, maternal mortality, nutritional status and prevalence of illness. In each case, they include continuous variables (e.g. weight-for-height ratios, test scores) and dichotomous variables (e.g. literacy status, infant and child mortality).

**Table 4.1 Indicators of health and education outcomes**

<b>Health</b>	<i>Source</i>
Infant and child mortality	DHS, MICS
Maternal mortality	DHS
Nutritional status of children (ages 0-5)*	DHS, MICS
Nutritional status of adults (15-49)**	DHS, MICS
Anaemia prevalence among children and/or adults	DHS, MICS
HIV prevalence	DHS
<b>Education</b>	<i>Source</i>
Highest grade of school completed	Household surveys (govt., DHS)
Literacy status	Household surveys (govt., DHS)
Student test scores	Specialist surveys (e.g. PISA, MLA)
Learning achievements (e.g. science, life skills)	Specialist surveys (e.g. PISA, MLA)

*Note:* \*Typically measured by three indices, namely height-for-age (stunting), weight-for-height (wasting) and weight-for-age (underweight); \*\*typically measured by height and/or body mass index (weight/height squared). DHS=Demographic and Health Surveys; MICS=Multiple Indicator Cluster

Surveys; PISA=Program for International Student Assessment; MLA=Monitoring Learning Achievement programme.

The standard source for evidence on health and education outcomes is household surveys. Most such surveys are carried out by national governments, often with the assistance of the World Bank. There is wide variation in the contents of these surveys, but most contain sections providing data on at least some health and education outcomes. Lists of World Bank-supported household surveys, available for use by researchers, can be found at: [www.worldbank.org/LSMS](http://www.worldbank.org/LSMS) and [www4.worldbank.org/afr/poverty/databank/default.cfm](http://www4.worldbank.org/afr/poverty/databank/default.cfm).

Some household surveys containing health and education indicators are carried out by international organisations and follow a more standardised pattern. These include the Demographic and Health Surveys (DHS) sponsored by USAID, which are available for 73 developing countries at approximately five-year intervals; new DHS surveys are carried out in around 10 countries every year (see [www.measuredhs.com](http://www.measuredhs.com)). These contain a great deal of relevant information on health and education outcomes. Information on health and education outcomes is also provided in Multiple Indicator Cluster Surveys (MICS) which are designed and carried out by UNICEF. By 2001, 65 developing countries had carried out MICS surveys (see [www.childinfo.org](http://www.childinfo.org)). There is coordination between the MICS and DHS surveys in terms of the countries surveyed and the questions included in the questionnaires, to ensure maximum possible coverage and comparability.

Some important outcome indicators are not contained in standard household surveys however, or are not considered sufficiently reliable when taken from such sources. These must instead be gathered via more specialised surveys. They include students' test scores and people's learning achievements, including literacy rates. For this reason, several national governments carry out separate assessments of learning achievements. Assessments are also carried out by international organisations, typically with the explicit intention of comparing achievements across countries. One such example is the Program for International Student Assessment (PISA), which provides data on the reading, mathematical and scientific literacy skills of 15-year olds in school (see OECD 2003), and now covers around 60 mainly developed or middle-income countries.

Another example is the Monitoring Learning Achievement (MLA) programme, a joint UNICEF-UNESCO initiative which has been in operation since the early 1990s. MLA surveys assess achievements of children in school grades 4-5 in basic learning competencies (literacy, numeracy and life-skills), and of children in school grade 8 in mathematics and science. As of 2003, MLA surveys had been carried out in 48 developing countries (see [www.literacy.org/Projects/explorer/un\\_back.html](http://www.literacy.org/Projects/explorer/un_back.html)). Others include the Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ), which began in 1991 and now covers 15 African countries, and the Latin American Laboratory for the Assessment of Quality in Education (LLECE), which began in 1997 and now covers 16 countries.

Two other specialist surveys which provide information on education outcomes are coordinated by the International Association for the Evaluation of Educational Achievement (IEA) (see [www.iea.nl](http://www.iea.nl)). The first is the Trends in International

Mathematics and Science Study (TIMMS), which has been measuring trends in student achievement in mathematics and science since the mid-1990s in around 60 countries. The second is the Progress in International Reading Literacy Study (PIRLS), which has been measuring trends in children's reading literacy achievement since the early 2000s, although mostly in developed countries.

The collection of data on learning achievements has been associated with a very large literature attempting to identify the determinants of achievement, focusing on factors such as pupils' background, school resources and so on. These are examples of the analysis of education production functions, as discussed in Section 3.1.

#### 4.1.2 Use of relevant goods and services

Relevant goods and services are goods and services which directly affect levels of attainment in the key health and education outcomes described above. Among these, one can distinguish between a) health and education services, and b) other relevant goods and services.

Examples of commonly available indicators of the use of health and education services are shown in Table 4.2. For health, they include medical attention in the event of sickness, immunisation against life-threatening diseases (e.g. diphtheria, pertussis and tetanus (DPT), measles), attendance of skilled personnel during birth, and the use of professional prenatal care. For education, examples include school enrolment and drop-out rates. Most of these are dichotomous indicators. The standard source for evidence on these indicators is household surveys.

**Table 4.2 Indicators of the use of health and education services**

<b>Health</b>	<i>Sources</i>
Medical attention in the event of sickness	DHS, govt. household surveys
Child immunisations (e.g. DPT, measles)	DHS, MICS
Attendance of skilled personnel at birth	DHS, MICS
Use of professional prenatal care	DHS, MICS
Malaria protection (e.g. bed-net use)	DHS, MICS
Child nutrition supplements (e.g. diarrhoea treatment)	DHS
<b>Education</b>	<i>Sources</i>
School attendance (current and recent)*	Govt. household surveys, DHS

*Note:*\* Can be used to calculate school attendance, repetition and drop-out rates (see Box 4);

\*\* estimated on the basis of reported household food consumption. DHS=Demographic and Health Surveys; MICS=Multiple Indicator Cluster Surveys.

Examples of indicators of the use of other relevant goods and services are shown in Table 4.3. These include source of drinking water, type of sanitation facilities, parental time availability and nutritional intake. They also include wider social and environmental determinants of health (e.g. inequality, pollution). The standard source for evidence on these indicators is again household surveys.

**Table 4.3 Indicators of the use of other relevant goods and services**

<b>Health</b>	
Source of drinking water (e.g. piped, well, open)	Govt. household surveys
Type of sanitation facilities (e.g. latrine, pit)	Govt. household surveys
Inequality	Govt. household surveys, DHS
Environmental quality (e.g. pollution)	Specialist surveys
<b>Education</b>	
Parental time availability (e.g. whether an orphan)	Govt. household surveys, DHS)
<b>Health and education</b>	
Calories consumed per day*	Govt. household surveys, DHS
Nutritional intake (e.g. proteins as a % of energy)*	Govt. household surveys, DHS

*Note:* \*Can be calculated from household food consumption. DHS=Demographic and Health Surveys.

An important point concerns the link between school attendance, repetition and drop-out rates (see Box 4). All three indicators provide relevant information, but for slightly different reasons. School attendance and drop-out rates both provide information about the amount of time spent in education: the higher the attendance rates, and the lower the drop-out rates, the greater the amount of time spent in education. By contrast, school repetition rates tell us more about the effect that time spent on school has on education outcomes: the higher the repetition rates, the lower the presumed effect of the time spent. For this reason, repetition rates provide an indication of the quality of education (considered in the next section). By contrast, low attendance rates and/or high dropout rates may be the result of the low quality of education, but this need not necessarily be the case.

#### **Box 4 Different measures of school participation**

Three different measures of school participation rates can be calculated from DHS surveys. These are:

- a) a child is considered to be **attending** school if he or she is attending school at the time of the survey;
- b) a child is considered to have **dropped out** of school if he or she was attending school the year before the survey and is not currently attending;
- c) a child is considered to be a **repeater** if, at the moment of the survey, the grade of school attended is the same as during the year before the survey.

Attendance rates are calculated by dividing the total number of attendees (a) by the total number of children of the relevant age range; drop-out rates by dividing the total number of drop-outs (b) by the total number of attendees in the previous year, and repetition rates by dividing the total number of repeaters (c) by the total number of attendees (a). All three measures can be analysed using econometric analysis (see Gibbons *et al.* 2005 for an example). As described in the main text, however, each provides a slightly different type of information.

#### *4.1.3 Quality of relevant goods and services*

Goods and services clearly differ in terms of quality. By quality we generally mean the increase in some health or education outcome (e.g. literacy status) likely to result from the use of the good or service. This cannot always be measured directly, but

various proxy indicators of quality can be identified instead. Various examples are shown in Table 4.4. In health, they include availability of functioning equipment (e.g. refrigerators, testing kits), trained staff (including attendance rates), and drugs and medicines (e.g. antibiotics). In education, they include teacher-pupil ratios, the availability of textbooks and the training level of teachers.

**Table 4.4 Indicators of the quality of health and education services**

<b>Health</b>	
Availability of functioning equipment	Specialist surveys
No. of qualified staff in regular attendance	Specialist surveys
Proportion of clinics	Specialist surveys
Treatment waiting times	Specialist surveys
<b>Education</b>	
Teacher-pupil ratios	Specialist surveys (e.g. PISA, MLA)
Availability of teaching materials (e.g. text-books)	Specialist surveys (e.g. PISA, MLA)
Training level of teachers	Specialist surveys (e.g. PISA, MLA)
Repetition rates*	Govt. household surveys, DHS

*Note:* \*Can be calculated from school enrolment information (see Box 2). DHS=Demographic and Health Surveys; PISA=Program for International Student Assessment; MLA=Monitoring Learning Achievement programme.

There has been much discussion in the literature on ways of measuring the quality of health and education services; see, for example, Alderman and Lavy (1996) and Filmer *et al.* (1997) for health and UNESCO (2004) for education. Most household surveys do not include measures of the quality of health and education services. For education, many of the surveys of learning achievements referred to in Section 4.1.1 provide information on school-level inputs. For health, information must typically be obtained from specialist surveys, some of which may be carried out by the government itself. The study by Collier *et al.* (2002) for example refers to a Government of Ethiopia survey which found that a quarter of public health stations and centres had no refrigerator and about half the public primary facilities lacked more than a quarter of essential drugs.

#### 4.1.4 Access factors

Finally, the access factors are those things which affect a person's use of relevant goods and services. Examples of commonly-available access indicators are shown in Table 4.5. They include the financial costs of the services (e.g. school tuition fees, health insurance premiums), the opportunity costs of the services (e.g. time taken travelling to and from a school or medical centre), household income, wealth and/or access to credit, family background, and various demographic characteristics.

As with the other indicators, available indicators of access factors include both continuous and dichotomous indicators. Some important access factors (e.g. household income or wealth) are in principle continuous but in practice are not reported directly; instead households are identified as being in different wealth or income groups (typically quintiles or deciles). In such cases it is possible to estimate the effect (on the use of a particular good or service) of being in a particular income

or wealth group, but not the effect of a small change in income or wealth within a group.

**Table 4.5 Indicators of health and education access factors**

<b>Health</b>	<i>Sources</i>
Financial costs (e.g. charges for drugs and medicines; health insurance premiums)	Sector-level studies/documentation
Distance to nearest health centre (km or time taken)	Govt. household surveys, DHS
<b>Education</b>	<i>Sources</i>
Financial costs (e.g. school tuition fees, school uniform costs)	Sector-level studies/documentation
Distance to nearest school (km or time taken)	Govt. household surveys, DHS
<b>Health and education</b>	
Household income (earned income, transfers etc.)*	Govt. household surveys
Household wealth and/or access to credit	Govt. household surveys, DHS
Family background (e.g. gender and education attainment of household head/caretaker)	Household surveys
Age, gender, ethnicity	Household surveys
Exposure to media and communication	Household surveys
Civil registration and documentation	DHS
Acceptability of publicly-provided services (e.g. separate-sex bathrooms in schools)	Specialist surveys

*Note:*\*not collected in DHS surveys, but household wealth indicators can be used as a proxy (for examples, see Gibbons *et al.* 2005, Ssewanyana and Younger 2005). DHS=Demographic and Health Surveys.

Note that the access factors in Table 4.5 are defined in relation to the use of a particular relevant good or service. Thus one access factor (e.g. household income) might have a strong impact on one relevant good or service (e.g. calorific intake), but a weak impact on the use of another good or service (e.g. immunisation). Note also that, as discussed in Section 3.1.2, it is possible and quite common to analyse the effects of different access factors on a given health or education outcome directly. The advantage with this combined approach is that it can be used if data on the use of relevant goods and services are not available or are considered unreliable. The disadvantage is that one cannot separate out the effect of each access factor on relevant goods and services from the effects of the use of those goods and services on the outcome under consideration; one is left with the overall effect only.

#### 4.1.5 Aggregation issues

Given the availability of household survey data, many of the indicators listed in Tables 4.1-4.5 can be collected at the level of the individual. This includes all of the outcome indicators and several of the goods and service indicators and access indicators. Such indicators can also be combined at the district, regional or national level to create aggregate measures, such as the average infant mortality rate, the proportion of all children of a relevant age group in school, and so on.

This raises an issue as to the most appropriate level of aggregation when analysing health and education indicators. On the whole, it makes most sense to make use of individual-level data when estimating health or education production or demand



functions. The reasons are twofold. First, the greater number of observations available in individual-level datasets allows the relevant coefficients to be estimated more accurately. Second, individual-level data also allow researchers to test for differences and/or inequalities between groups (e.g. men versus women, rural vs. urban areas) in ways which are not possible when using aggregate-level data (e.g. national averages including data for rural and urban areas).

There are of course numerous examples in the literature of the analysis of health and education indicators using aggregated-level data. This reflects the greater availability of national-level data in easily accessible sources such as the World Bank's *World Development Indicators* (see Appendix 8). It also reflects a longstanding tradition among development economists of trying to explain why some countries seem to 'perform' so much better in human development than others. (This latter issue is discussed further in Section 6). In these sorts of studies it is recognised that there are some variables which are important determinants of education and health but which are not included in the regression analysis because the necessary data are not available for a large enough number of countries. One prominent example is the amount of private expenditure by households on education or health.

There are, however, some advantages to using more aggregated data to analyse health or education indicators. One reason is that analysis of national-level data takes account of spillover and externalities. For example, being vaccinated against a major disease may well raise a person's life expectancy. It may also raise the life expectancy of other, unvaccinated persons, by limiting the transmission of the disease in question (a positive externality). While the analysis of individual-level data will capture the first of these benefits, it will not capture the latter and will therefore tend to underestimate the overall benefits of vaccination. By contrast, the analysis of more aggregated data can in principle capture the wider 'social' as well as the 'private' benefits. For recent evidence that health externalities may well be significant in size, see Miguel and Kremer (2004).

Another advantage of more aggregated data is that some things simply do not vary enough across individuals or households for their effects to be estimated accurately using individual- or household-level data. One example is user fees for health or education services. These often do not vary significantly across households, save for any exemptions or reductions for low-income households. To analyse the effect of user fees on usage of health or education services, we typically need more aggregate-level data, collected on a regular basis over a period of time in which financial costs do vary (e.g. before and after a large change in user fees). Disaggregated, individual-level data is often not very useful in such cases.

In summary, therefore, although analysis of disaggregated (household- or individual-level) data is generally preferable, analysis of more aggregated data (at regional or national-level) can sometimes complement this analysis.

#### 4.2 *Evidence on costs of health and education services*

Section 3.2 discussed ways of costing government actions designed to raise the accessibility and/or quality of publicly-provided health or education services. Sources

of evidence for producing such estimates depend very much on the type of service, but there are four main sources.

The first is consultation with health and education sector specialists. For example, Bruns *et al.* (2003) estimate the cost of classroom construction on the basis of values that ‘regional experts consider to be a “good practice” level’ (ibid.: 143), while Kombe and Smith (2003) estimate the cost of HIV monitoring and training costs in Zambia following interviews with health workers and government officials.

The second is official information. For example, Kremer *et al.* (2002) estimate teachers’ salaries in Kenya on the basis of official salary scales, while Kombe and Smith (2003) estimate the cost of drugs for HIV treatment in Zambia using price information from the major international suppliers of such drugs. Similarly, Collier *et al.* (2002) estimate the cost of constructing a primary health care centre in Ethiopia on the basis of budget estimates provided in the Ministry of Health’s planning documentation.

The third is results from ex-post costing exercises. A number of studies exist which have looked in detail at the actual cost of specific government (or non-governmental) health and education programmes carried out in recent years. One such example is the study by PCD (1999) on the cost of school de-worming programmes in Ghana and Tanzania.

The final source is public expenditure data, contained in official government accounts available in national documents, international sources such as the IMF’s *Government Financial Statistics*, the UNESCO *Statistical Yearbook* (for expenditure data), or in World Bank *Public Expenditure Reviews*. For example, Colclough and Al-Samarrai (2000) and Collier *et al.* (2002) use information from these sources to calculate the average unit cost of providing primary education and primary health care respectively. (Public Expenditure Reviews are carried out at fairly regular intervals for all World Bank borrowing countries; a list of recent reviews carried out is available on the World Bank website, although not all are publicly available). The overall framework followed by each review is described in Pradhan, 1996.)

Care should be taken when using public expenditure data as the information source. One reason is that there may be substantial inefficiencies in public sector provision or substantial wastage or leakage of resources through corruption, which means that costs are significantly lower than indicated by the public expenditure figures. Another is that the costs of additional provision of a public service may differ from the costs of existing levels of provision, in particular if there are economies or diseconomies of scale. If, for example, the 10% of children not enrolled in school live in remote rural areas, the costs of providing education services to them will in all likelihood be higher than the average cost for the remaining 90%.

#### 4.3 *Evidence on determinants of economic growth*

As outlined in Section 2.5, assessing the revenue constraints facing a government requires estimates of the effects of raising government revenue on economic growth, and the effects of health and education on economic growth. One major source of these estimates is econometric studies of the determinants of economic growth.

A large number of such studies are available in the literature; a selection of these is summarised in Tables 4.6 and 4.7. Table 4.6 shows estimates of the effect of various health and education indicators on economic growth, including school enrolment rates, life expectancy, and child mortality rates. Table 4.7 then shows the effects of various indicators correlated with government revenue, including the ratio of government expenditure to GDP, the ratio of public and private investment to GDP, the rate of inflation and the ratio of overseas aid to GDP. Inflation is included since high inflation is often a symptom of the inflationary financing of government deficits. In the case of aid, most studies find an inverse U-shaped relationship between aid and economic growth; Table 4.7 therefore reports the estimated level of aid as a share of the recipient-country's GDP at which aid begins to reduce economic growth. If aid is kept below this level, it is unlikely to have a negative effect on growth.

The studies summarised in Tables 4.6 and 4.7 provide a basic set of estimates for evaluating the effect of a government action on economic growth. There are various other studies which could be added to each table through carrying out a more extensive literature review. The number of such studies is also increasing over time as new research is carried out. A useful review of all the recent studies analysing the effect of health indicators on economic growth is provided by Bloom *et al.* (2004).

Results from studies such as those shown should be treated with a certain degree of caution, since they are essentially cross-country averages. Nevertheless, many studies do test for differences in the size or direction of the estimated effects across different types of countries. For example, Barro and Sala-i-Martin (2005) find that the negative effect of government expenditure on growth and the positive effect of education are both larger (around double) in size in low-income countries. Similarly, the estimates of Burnside and Dollar (2000) and Collier and Dollar (2002) show that the point at which aid begins to reduce economic growth varies according to country characteristics. Wherever possible, allowance should be made for differences in the estimated effects of different indicators on economic growth across countries.

Some studies of economic growth use data measured at the regional or district level for a single country over time. Examples include the studies by Fan *et al.* (1999) and Fan *et al.* (2002) of India and China respectively. Such studies should also be used where available; for a review see Paternostro *et al.* (2007). This caveat notwithstanding, the studies in Tables 4.6 and 4.7 suggest that the negative effects on economic growth associated with financing government expenditure appear to be small, compared to the positive effects on growth of raising health and education indicators.

Finally, although the studies reported in this section refer to the determinants of economic growth, the determinants of other important intermediate variables (e.g. the supply of trained health personnel) can in principle be assessed in a similar way. For these other variables, however, much less empirical evidence is currently available, meaning that new econometric work would need to be undertaken.

**Table 4.6 Estimated effects of health and education on economic growth**

Study	Indicator(s) analysed	Estimated effect <sup>#</sup>
MRW (1992)	Secondary enrolment, % of labour force	Doubling this ratio raises growth by 0.1-0.2% per year
BS (1994)	Years of schooling	Doubling initial years of schooling raises growth by 0.0-0.2% per year
BIS (1998)	Life expectancy at birth	Raising life expectancy at birth from 50 to 55 raises growth by 0.2-0.6% per year
T (1999)	Years of schooling	Doubling years of schooling over period raises growth by 0.0-0.2% per year
KL (2001)	Years of schooling, initial	An increase in initial years of schooling by one year raises growth by 0.2-0.6% per year
	Years of schooling, additional	An increase in additional years of schooling by 1 year over a 5-year period raises growth by 0.2-1.3% per year
DK (2002)	Secondary school attainment, average years	An additional year of secondary schooling raises growth by 0.0-0.2% per year
MOV (2003)	Secondary enrolment, % of labour force	Doubling this ratio raises growth by 0.1-0.3% per year
BSM (2005)	Life expectancy at age 1	Raising life expectancy at age 1 from 45 to 50 raises growth by 0.7-1.5% per year
	Total fertility rate	Halving the total fertility rate raises growth by 0.1-1.5% per year
	Upper-level* schooling attainment, average years	An additional year of upper-level schooling raises growth by 0.0-0.7% per year

*Notes:* MRW=Mankiw, Romer and Weil (1992, Table 5 column 1); BS=Benhabib and Spiegel (1994, Table 4 column 2); BIS=Bloom and Sachs (1998, Table 6, column 3); T=Temple (1999, Table 1, column 2); KL=Krueger and Lindahl (2001, Table 3 column 3); DK=Dollar and Kraay (2002, Table 6 column 1); MOV=Milbourne, Otto and Voss (2003, Table 7 column 1); BSM=Barro and Sala-i-Martin (2005, Table 12.3 column 2). <sup>#</sup>This column shows the 95% confidence interval for the effect of each indicator on economic growth (given by two standard errors either side of the mean estimated effect). \*Includes secondary and tertiary education. This list is not meant to be exhaustive, and can be expanded through a comprehensive review of the empirical literature. The list will grow over time as more studies using improved methods and expanded datasets become available.

**Table 4.7 Estimated effects of fiscal indicators on economic growth**

Study	Indicator(s) analysed	Estimated effect <sup>#</sup>
MRW (1992)	Investment**	A doubling of investment as a share of GDP raises growth by 0.2-0.5% per year
ER (1993)	Budget surplus	An increase in deficit of 3% of GDP reduces growth by 0.2-0.7% per year
	Government expenditure*	An increase in expenditure by 5% of GDP reduces growth by 0.1-0.9% per year
	Rate of income tax	An increase in the marginal tax rate by 10 percentage points reduces growth by 0.0-1.3% per year
DSZ (1996)	Govt. expenditure, current	An increase in the share of current expenditure in total expenditure by 20% raises growth by 0.0-0.2% per year
BD (2000)	Budget surplus	An increase in deficit of 3% of GDP reduces growth by 0.0-0.4% per year
	Inflation	An increase in inflation by 10% per year reduces growth by 0.1-0.2% per year
	Aid	Aid begins to reduce growth when it reaches a point between 2% and 13% of GDP
HT (2001)	Budget surplus	An increase in deficit of 3% of GDP reduces growth by 0.1-0.5% per year
	Inflation	An increase in inflation by 10% per year reduces growth by 0.0-0.2% per year
	Aid	Aid begins to reduce growth when it reaches a point between 6% and 39% of GDP
CD (2002)	Aid	Aid begins to reduce growth when it reaches a point between 5% and 16% of GDP (PPP) <sup>#</sup>
DK (2002)	Government expenditure*	An increase in expenditure by 10% of GDP reduces growth by 0.0-0.2% per year
MOV (2003)	Public investment	A doubling of public investment as a share of GDP raises growth by 0.0-0.3% per year
BSM (2005)	Government expenditure*	An increase in expenditure by 5% of GDP reduces growth by 0.1-0.5% per year
	Inflation	An increase in inflation by 10% per year reduces growth by 0.0-0.4% per year
	Investment**	An increase in investment by 5% of GDP raises growth by 0.2-0.7% per year
GCBM (2005)	Budget balance	An increase in deficit of 3% of GDP reduces growth by 0.7-2.0% per year
	Domestic borrowing	An increase in domestic borrowing of 3% of GDP reduces growth by 1.4-3.3% per year
	External borrowing	An increase in external borrowing of 3% of GDP reduces growth by 0.4-1.9% per year
	Public sector salaries	An increase in public sector wages and salaries of 1% of GDP reduces growth by 0.0-1.1% per year
	Public investment	An increase in public investment of 1% of GDP raises growth by 0.2-1.0% per year

*Notes:* As Table 4.4, plus ER=Easterly and Rebelo (1993, Table 4 column 1); DSZ=Devarajan, Swaroop and Zou (1996, Table 2 columns 2.1 and 2.2); BD=Burnside and Dollar (2000, Table 1 column 1 for budget surplus and aid, and Table 5 column 7 (OLS) for aid); HT=Hansen and Tarp (2001, Table 1, column 1.2); CD=Collier and Dollar (2002, Table 1 column 2); GCBM=Gupta, Clements, Baldacci and Mulas-Granados (2005, Table 3 columns 1, 3 and 5). \*Government consumption expenditure, not including defence or education expenditure; \*\*includes public and private investment; <sup>#</sup> assumes a CPIA score of 3.5. This list is not meant to be exhaustive, and can be expanded through a comprehensive review of the empirical literature. The list will grow over time as more studies using improved methods and expanded datasets become available.

#### 4.4 *Evidence on the effect of economic growth*

As discussed in Section 2.5, empirical evidence suggests there is a close relationship between economic growth and improvements in a range of health and education indicators. In other words, economic growth is an intermediate variable affecting future levels of realisation of several different rights.

Here we briefly review some of this evidence. Recent studies showing a link between economic growth and particular health and education indicators, at the national level, include Pritchett and Summers (1996), Filmer and Pritchett (1999), Or (2000), Al-Samarrai (2002), Hanmer *et al.* (2003), Ranis and Stewart (2005) and McGuire (2006). These studies typically measure economic growth by the percentage increase in GDP or GNP per capita, measured at constant prices and PPP exchange rates. The regressions also control for a range of other variables thought to affect the health or education indicator under consideration, such as urbanisation, income inequality, female education, gender equality, public spending on health and/or education, and so on.

Of the above studies, that by Pritchett and Summers (1996) deserves special mention. The reason is that this study controls for possible reverse or spurious causation between economic growth and health and education, using the econometric method of instrumental variables estimation.<sup>13</sup> The study suggests that in the medium to long term, a rise in economic growth by 1 percentage point per year would raise the rate of reduction in infant and child mortality by between 0.2 and 0.4 percentage points per year.

Finally, there are several studies of the determinants of health and education using data for single countries where there are data measured at the regional, district or household-level. These are simply examples of the analysis of health and education production and demand functions described in Section 3.1; for a review of such studies, see Strauss and Thomas (1995).

#### 4.5 *Other relevant indicators: policy variables and constraints*

This section discusses two other types of indicators which are relevant for assessing government compliance with the ICESCR: indicators of policy variables and indicators of available resources.

##### 4.5.1 *Policy variables*

A policy variable refers to a tool or instrument that the government can use to achieve its objectives. More specifically, it is something which has some effect, direct or indirect, on at least one of the government's objectives, and it is something that the

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<sup>13</sup> More specifically, they utilise information on changes in countries' international terms of trade (defined as the price of a country's exports on world markets, divided by the price of its imports). Unless a country is very large (like China, India or the US), its terms of trade are unaffected by anything which occurs in the country itself; they are determined instead simply by world market conditions. However, a country's terms of trade will certainly affect the country's rate of economic growth, at least in the short to medium run. Thus any correlation between countries' terms of trade and their health and education indicators implies a direct causal effect of income on health and education.

government – and only the government – determines the precise level of. Examples include:

- the levels of direct and indirect taxes and transfers;
- the levels of indirect taxes and subsidies on goods and services;
- the amount and quality of different inputs purchased by governments in providing public services (e.g. number of teachers hired);
- the user fees or charges applied to public services;
- price controls (e.g. minimum wages, interest rate ceilings);
- legislative measures (e.g. whether or not primary education is compulsory).

Three other variables can, with certain qualifications, be considered policy indicators. These are:

- the level of government expenditure on a particular sector (e.g. health, education, defence);
- the level of tax revenue as a share of GDP or GNP;
- the availability of health and education inputs (e.g. teachers, nurses, midwives or physicians, hospital beds).

Strictly speaking, these indicators are not policy variables. Expenditure is determined not only by the amount and quality of different inputs purchased by the government but also by the prevailing market prices of the inputs being purchased, which is generally beyond the control of the government. Tax revenues are determined not only by the levels of different direct and indirect taxes set by the government but also by households and firms' responses to those taxes, which are again generally beyond the control of the government. Finally, the availability of health and education inputs will typically include inputs made available by private and other non-governmental suppliers (e.g. aid agencies, NGOs). Despite these caveats, however, these three indicators will typically be correlated quite closely with the underlying 'true' policy variable(s), and can for this reason be regarded as proxy policy variables.

In terms of sources of evidence on policy variables, information on government expenditure and tax revenues can be collected from international sources such as the World Bank's *World Development Indicators* and the IMF's *Government Financial Statistics* Yearbook. Information on the availability of health and education workers and other inputs are published in WHO *World Health Reports*, the WHO's *Global Atlas of Health Workforces* and UNESCO *Statistical Yearbooks* (they are also reported in the World Bank's *World Development Indicators*). Mostly, however, evidence can only be obtained through country-level investigation of government documentation.

It is important to be clear about how evidence on the levels of different policy variables can be used to monitor government obligations under the ICESCR. In some cases, the ICESCR requires governments to adopt a particular level of a policy variable. This is the case with primary education for example, which is required to be free at the point of use (Article 13.2a): i.e. the user fee associated with this service must be zero. Compliance with these aspects of the ICESCR can be ascertained directly through observing the levels of these policy variables (i.e. whether or not user fees are charged for education) in a particular country.

In most cases, however, the ICESCR does not commit governments to specific levels of different policy variables. This means that simply observing the levels of these variables cannot tell us whether a government is complying with its obligations. For this reason, with the above exceptions, evidence on the levels of different policy variables does not play a direct role in the methodology.

However, the levels of different policy indicators still provide useful and important information. First, it is through potential changes in a government's policy variables that we can infer whether or not a government is complying with its obligations. This is the rationale underlying the approach to monitoring outlined in this paper. Second, their levels may also be useful in terms of identifying countries in which to apply the methodology (see Section 6). Third, they may also be useful in identifying the potential government actions which could raise levels of realisation of the right to health or education. If, for example, the availability of physicians in a country appears to be particularly low, it might be worth exploring whether the overall effect of employing more physicians would be to raise the level of the realisation of the right to health.

#### *4.5.2 Available resources*

A key feature of government obligations under the ICESCR is the notion of available resources. In the basic resource allocation framework, a government's available resources can be interpreted as the constraints which it faces in trying to achieve its objectives. In this section we ask what indicators for a government's available resources can be identified, and what role they play in the proposed methodology.

The notion of available resources has been discussed extensively elsewhere (e.g. Robertson 1996). This discussion emphasises that available resources include all domestic resources of the country, and not just the government's revenues; human, physical and natural resources, and not just financial resources; and resources obtained through international assistance as well as from domestic sources. For this reason, the notion of available resources cannot be captured by any one single indicator. Nevertheless, it can be captured, at least in part, by a series of indicators, including:

- the level of national income, as measured by Gross Domestic Product (GDP) or Gross National Product (GNP);
- the availability of natural resources (e.g. oil, gas, minerals, metals);
- the supply of trained workers (e.g. doctors, nurses, teachers, lawyers);
- the amount of aid that the government receives from abroad.

Three main points about these indicators are worth noting. The first is the distinction between GDP and GNP. GDP is a measure of total income earned domestically (i.e. within a country's borders); it includes income earned domestically by foreigners, but does not include income earned by domestic residents abroad. GNP is a measure of total income earned by a country's residents. It includes the income that residents earn abroad, but does not include the income earned domestically by foreigners. Both GDP and GNP are relevant for assessing available resources, since a government is entitled



to tax both the income that nationals earn abroad and the income earned domestically by foreigners (Musgrave 2006).

The second point is that, in the short run at least, each indicator limits the feasible range of at least some of the government's policy variables. For example, the level of GDP or GNP limits the amount of revenue a government can raise. Similarly, the amount of aid the government receives limits the amount by which its spending can exceed its tax revenue.

The third point is that, beyond the short run, each indicator can be influenced by government policies and actions. For example, the availability of trained workers (e.g. doctors, teachers) is likely to be influenced by the amount the government spends on tertiary education, as well as the number of such workers the government employs and the salaries it pays them. Even the availability of natural resources such as oil and gas is affected by the extent of the resources the government puts into exploration, or at least the tax and licensing agreements it imposes on private (mainly foreign) exploration companies.

Because each of the above indicators is at least partly under the government's control, we have to be careful in labelling the above indicators as constraints. In the context of the basic resource allocation framework, a constraint is something which a) limits the feasible range of at least one of the government's policy variables and b) is determined by circumstances which are outside the government's control. Each of the indicators listed in this section meets the first of these criteria, but does not – other than in the short run – meet the second. There are in fact no readily-available indicators which represent constraints in this true sense of the term.

We also have to be careful in the way in which such indicators are used in the methodology. They can play a role in identifying countries in which to apply the methodology (see Section 6). If, for example, the level of realisation of a particular right appears to be particularly low, given the existing extent of the resources a government has available, such a country might be considered a priority in terms of applying the methodology. In applying the methodology, however, we must take account of the potential effects of a government's actions on the extent of its available resources.

## 5 Challenges, limitations and constraints

This section discusses the types of challenges, limitations and constraints likely to be faced when applying the methodology set out in Section 3 in any one particular country context. Five issues are discussed, namely data availability (Section 5.1), model complexity (Section 5.2), uncertainty regarding key relationships and parameters of interest (Section 5.3), uncertainty regarding the precise nature of government obligations under the ICESCR, and finally issues relating to the rights to health and education in relation to all human rights (Section 5.5).

### 5.1 *Data availability*

Clearly, the methodology outlined in Section 3 is heavily dependent on the availability of up-to-date, reliable and representative data on a whole range of variables and indicators (as set out in Section 4). In the absence of such data it is very difficult to establish whether people are enjoying their rights to education, let alone whether the relevant duty-bearers have complied with their obligations to raise levels of enjoyment.

There is little that can be done in the absence of a fairly recent, nationally-representative household survey including information on relevant health and education indicators. The choice of countries in which to apply the methodology should therefore be heavily dependent on the availability of such a survey. Countries which do not have such surveys could be considered to be not complying with their obligations under the ICESCR, since without such surveys it is close to impossible to establish whether they are doing so or not.

### 5.2 *Model complexity*

As discussed in Section 2, the links between government actions and levels of realisation in or attainment of the minimum essential levels of the right to health or education are inherently complex. This is particularly so when taking into account the effects of raising the revenue requirements of such actions. Here, these links are assessed using certain rules of thumb derived from general principles.

Ideally, however, they would be assessed using more detailed and potentially quite complex economic models. For this reason, it is important to be aware of the limitations of the rules of thumb outlined in this paper. First, they assume a particular set of simplified relationships between health and education, government expenditure and economic growth and other intermediary variables (e.g. the supply of trained health and education workers). These are not unreasonable from a theoretical perspective, and on the whole they receive a lot of support from the empirical evidence. However, the relationships are still likely to be a good deal more complex in practice, and the rules of thumb proposed in this paper could be criticised for this reason.<sup>14</sup>

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<sup>14</sup> It should be noted, however, that any such (constructive) criticism would in fact be welcome, since highlighting any ways in which the proposed rules of thumb are overly simplified would suggest improvements to those rules. This would lead to greater accuracy in the methods used to assess the links between government actions and levels of realisation of the rights to health and education, and an improvement in the methodology.

Unfortunately, it is difficult to be clear how different the results of a more complete assessment, based on a detailed economic model, would differ from those obtained from the rules of thumb outlined in this paper. The only way to proceed is to gradually develop, over time, more detailed and complex models, and to test the extent to which results do change. Extending and/or qualifying the various rules of thumb outlined in this paper are therefore important areas for further work.

### 5.3 *Uncertainty regarding key relationships and parameters of interest*

Even if we know with certainty the precise form of the relationship between a government policy variable and a particular health or education indicator, there is still likely to be a substantial degree of uncertainty about the magnitude of the relationship. This reflects the fact that relevant parameters and relationships in any underlying model – for example, the link between the cost of a service and its use – can themselves only be known with uncertainty. Instead, we will generally only have a confidence interval for each effect which is potentially quite wide.<sup>15</sup>

Similarly, for the costing exercise (set out in Section 3.2), it may only be possible to specify a plausible range for the cost of some inputs, especially when considering the likely costs of inputs in future years (which will be unknown). This means that rather than providing a single figure for the cost of a particular government action, we are instead providing a plausible cost range, which is potentially quite wide.

Clearly, the greater the uncertainty attached to key relationships and parameters of interest, and to costing estimates, the more difficult it will be to establish that there are actions a government could take which would raise levels of realisation, or attainment of the minimum essential levels, of the rights to health and education, and therefore whether it is complying with its obligations. For this reason, ways of reducing the confidence intervals associated with key parameters of interest (e.g. by controlling for identifiable sources of measurement error), and/or the uncertainty associated with costing estimates, should be explored wherever possible.

Nevertheless, it is by no means clear or obvious that standard amounts of uncertainty regarding key relationships and/or parameters of interest will be so large as to make it impossible to establish whether or not a government is complying with its obligations, except perhaps in the most blatant of cases. This is instead something which must be explored on a case-by-case basis.

A final point is that a more serious problem than uncertainty in key relationships or parameters of interest is bias in the estimated values of those relationships and parameters. As discussed in Section 3.1.6, standard econometric estimates of certain key relationships may well be biased in ways and by amounts which are difficult to establish. The only way to address this problem is to make use, wherever possible, of alternative sources of evidence. These include experimental or randomised

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<sup>15</sup> A confidence interval provides a range of values for the estimated effect of one variable on another, together with a percentage figure (e.g. 90% or 95%) indicating how confident one can be that the true effect lies within the range provided. It is related to the concept of statistical significance (see Section 3.1.3).

programme evaluations and qualitative survey work (e.g. willingness to pay for studies).

#### 5.4 *Uncertainty regarding nature of government obligations under the ICESCR*

As discussed in Section 2, it is very important to be clear about the precise nature of governments' obligations under the ICESCR. A substantial amount of clarification on this has been provided in recent work (e.g. Alston and Quinn 1986, Felner 2007 amongst others). This was extended in Section 2 of this paper by linking the different dimensions of government obligations under the ICESCR to the basic resource allocation framework used by economists and public expenditure specialists to analyse government resource allocation decisions.

At the same time, however, it should be recognised that certain uncertainties in relation to these obligations remain. Two in particular are most important. The first relates to the distinction between a government's minimum core obligations on the one hand, and a government's obligation to progressively realise the rights set out in the ICESCR on the other. The key difference is that under the former, the government is required to prioritise the attainment of the minimum essential levels of each right over all other possible objectives it may hold. Under the latter, there is no requirement to prioritise any one objective over another.

This raises an important question; namely, when can we say that the minimum essential level in a right has been attained. As discussed in Section 2.2, it is generally accepted that the minimum essential level of the right to health or education refers to people's access to (or actual use of) the goods and services which are particularly important – or essential – for attaining key health or education outcomes. Furthermore, there are methods for establishing which goods and services (and/or amounts therefore) can be regarded as essential, as discussed in Section 3.1.7. However, it is unclear which particular outcomes are considered relevant in this context; do they include all possible outcomes, or just certain core outcomes, such as survival to a minimum age and a certain level of literacy? It is also unclear what level of use of an essential good or service is considered consistent with universal access to that good or service.<sup>16</sup>

These uncertainties are not insurmountable, and can be clarified through further discussion and debate. At present, however, they make it more difficult to establish whether or not a government is complying with its minimum core obligations.

The second area of uncertainty relates to the issues of time horizons and discount rates. As discussed in Section 2.4, there may well be government actions which can bring about an increase in levels of realisation or attainment of the minimum essential levels of the rights to health and education in the short run, at the expense of lower

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<sup>16</sup> This reflects a judgement about the proportion of people not likely to make use of an essential good or service despite having access to it. This is relevant to the extent that the notion of access to such goods and services is itself relevant; if not we would simply say that any person not making use of the good or service has not attained the minimum essential level of the right to health or education. Arguably for most of the essential goods and services in relation to health and education (e.g. primary education, immunisation) the notion of access, as distinct from actual use, will have limited relevance. But it may have more relevance in the case of other rights.

levels in the medium to long run. The overall effect of such actions (i.e. taking into account both short-run and medium- to long-run effects) can only be assessed if we know what the ICESCR requires regarding a) the discount rates to be applied to levels of realisation in future years, and b) the appropriate time horizon over which a government's actions are to be assessed, which as yet remains unclear. Once again, these uncertainties are not insurmountable, and can be clarified through further discussion and debate. At present, however, they make it more difficult to establish whether or not a government is complying with its minimum core obligations, or with its obligations to progressively realise the rights set out in the ICESCR.

### *5.5 Relation between rights to health and education and all human rights*

Finally, any assessment of government compliance with obligations in relation to the rights to health and education requires taking account of other ESC rights (e.g. right to an adequate standard of living). This is because even if there are steps a government could take which would raise levels of realisation of the rights to health and education, it would be justified in not taking those steps if they were to reduce levels of realisation of another right (e.g. the right to an adequate standard of living).

More generally, by focusing on health and education only it is not generally possible to say whether or not a government is complying with its obligations to progressively realise economic, social and cultural rights, or with its minimum core obligations. The methodology set out in Section 3 needs to be applied to all other ESC rights before an overall assessment of government compliance can be made.

It may also be necessary to take into account government obligations under other human rights agreements such as the International Covenant on Civil and Political Rights (ICCPR). This is particularly the case given the growing recognition that the realisation of many civil and political rights is subject to resource implications and constraints (Norton and Elson 2002: 21). Clearly, these are both demanding exercises, but nonetheless represent the single most important direction in which the methodology outlined in this paper needs to be extended.

## 6 Identifying countries in which to apply the methodology

The methodology outlined in Sections 3–5 of the paper is designed to be applicable in any one particular country context. It is designed to assess, as accurately as possible given constraints on data availability and available resources, whether the government is complying with certain key dimensions of its obligations under the ICESCR. The question addressed in this final section is whether (and if so, how) quantitative methods can also be used to identify countries in which there is a high chance that the application of the methodology will generate the conclusion that the government is not complying with these dimensions of its obligations under the ICESCR.

### 6.1 Identifying underperformers

One approach is to compare the levels of relevant health or education indicators in one country with those of other countries with similar levels of resources. This sort of analysis can be carried out using cross-country data taken from sources such as the World Bank's *World Development Indicators*. This contains data on a large number of relevant health and education indicators for many countries and at different points in time (see Appendix 7 for more details).

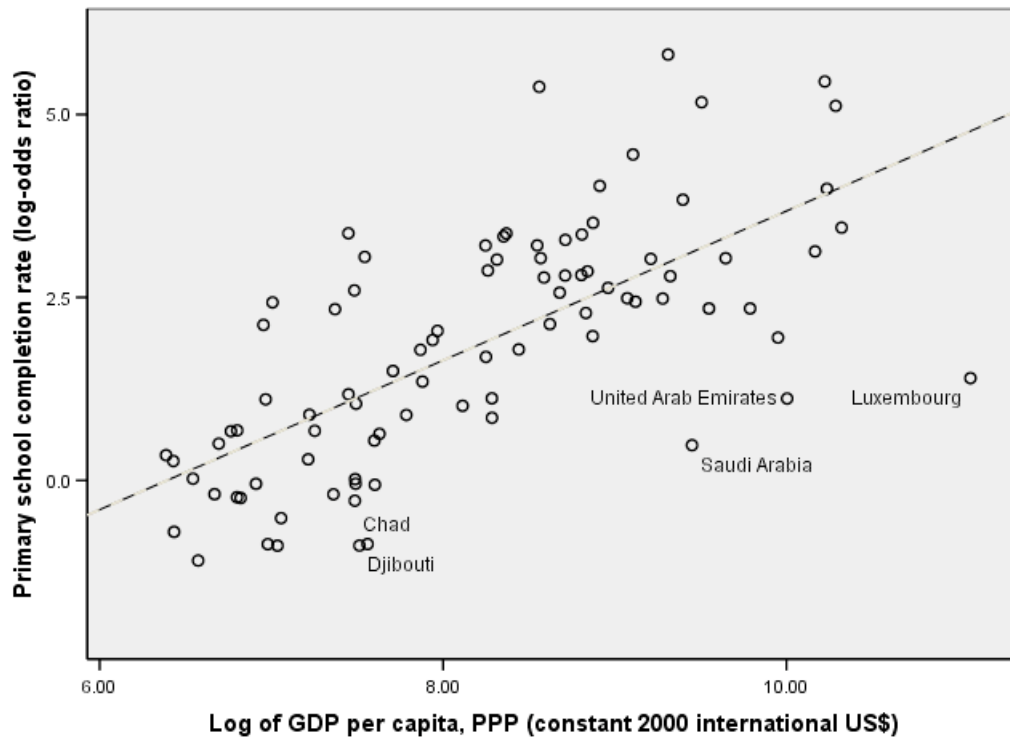
Two simple examples of this approach are shown in Figures 7.1 and 7.2. These consider two possible core indicators, one for education (the primary school completion rate) and one for health (the infant survival rate). The levels of these indicators in each graph are compared against countries' levels of GDP per capita, measured at purchasing power parity (PPP) exchange rates. Each point in each graph represents a different country, and the data in each graph refer to 2004.

Figures 7.1 and 7.2 confirm that there is a strong, positive relationship between GDP per capita and both primary school completion and infant survival rates.<sup>17</sup> Nevertheless, there are some countries in which the primary school completion or infant survival rate is considerably below the level typically observed in other countries with similar levels of GDP per capita: Chad, Djibouti, Saudi Arabia and United Arab Emirates in the case of primary school completion, and Angola, Azerbaijan, Botswana, Gabon, Kazakhstan, Namibia, South Africa and Swaziland in the case of infant survival.

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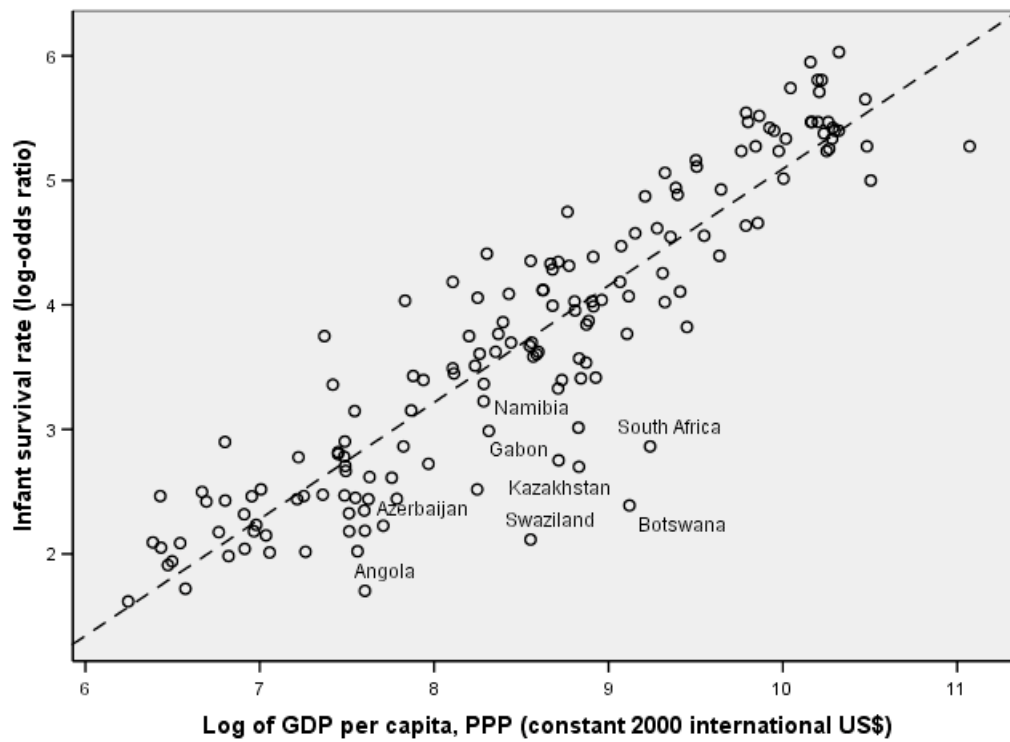
<sup>17</sup> Note also that the broad relationship between the indicators and GDP per capita is approximately linear in each case. This has been achieved by expressing GDP per capita in logarithms, and the primary completion and infant survival rates in 'log-odds' ratios.

**Figure 6.1 GDP per capita and primary school completion rates, 2004**



Source: World Bank World Development Indicators 2006

**Figure 6.2 GDP per capita and infant survival rates, 2004**



Source: World Bank World Development Indicators 2006

A natural extension of this approach is to compare levels of relevant health and education indicators against a range of country characteristics rather than just one. In this case, the technique of multiple regression analysis could be used. To illustrate, Table 6.1 shows the results of two multiple regressions, one in which the dependent variable is the primary school completion rate, and another in which the dependent variable is the infant survival rate. There are various explanatory variables which could be included in regressions of this sort, but for illustration just two are included: log GDP per capita, again measured at PPP exchange rates, and log population density.<sup>18</sup>

The results confirm what we expected from analysis of the scatter plots, namely that GDP per capita has a positive impact on both primary school completion and infant survival rates.<sup>19</sup> Population density also has a positive and statistically significant impact on the infant survival rate as expected, but it does not have a significant impact on the primary school completion rate.

**Table 6.1 Effects of GDP per capita and population density on core health and education indicators: multiple regression analysis**

	Primary school completion rate	Infant survival rate
Constant	-7.20	-4.15
- p-value	<0.01	<0.01
Log GDP per capita	1.11	0.93
- p-value	<0.01	<0.01
Log population density	0.08	0.11
- p-value	0.41	<0.01
R <sup>2</sup>	0.52	0.84
No. of countries	88	158

Notes: Data refer to 2004. As in Figures 6.1 and 6.2, primary school completion and infant survival rates are expressed in terms of 'log-odds' ratios.

The results in Table 6.1 can be used to identify which countries have primary school completion and/or infant survival rates which are considerably below the average or typical levels for countries with similar levels of GDP per capita and population density.<sup>20</sup> These are listed in Table 6.2. A natural extension to this approach is to add more explanatory variables to the multiple regressions.

<sup>18</sup> Population density is included since it may affect primary completion rates or infant survival rates by affecting the costs of delivering and/or accessing education and health care services.

<sup>19</sup> The p-values associated with the coefficients on GDP per capita are both less than 0.01, which tells us that its effect on the two indicators is statistically significant at the 1% level, which is a high level of statistical significance. The standard cut-off for saying a coefficient is statistically significant is a p-value of below 0.05 or even 0.10.

<sup>20</sup> This involves first calculating the difference between the actual and expected level of the relevant health or education indicator for each country. This is referred to as the residual. It then involves selecting those countries with negative residuals below some cut-off point. Here the cut-off point used is one standard deviation below the mean, which has been used in previous work in judging poor performance in welfare indicators at the national level (e.g. Anderson and Morrissey 2006, Stewart and Brown 2006). Alternative cut-offs are possible, however.



**Table 6.2 Underperformers in core health and education indicators: illustrative results from multiple regression analysis**

Primary school completion rate (13)	Infant survival rate (28)		
United Arab Emirates	Swaziland	Lesotho	Mexico
Saudi Arabia	Botswana	Chad	Seychelles
Djibouti	South Africa	Saudi Arabia	
Cyprus	Kazakhstan	Pakistan	
Chad	Azerbaijan	Brazil	
Mozambique	Angola	Iran, Islamic Rep.	
Burkina Faso	Gabon	Dominican Republic	
Kuwait	Cambodia	Turkey	
Rwanda	India	Gambia, The	
Guinea	Namibia	Rwanda	
Comoros	Guinea	Djibouti	
Guatemala	Bahrain	Cote d'Ivoire	
Senegal	Trinidad and Tobago	United States	

*Notes:* Countries listed are those whose residuals from the regressions estimated in Table 6.1 are greater than one standard deviation below the mean residual. The residual is the difference between the actual and predicted value of the relevant health or education indicator. The predicted primary school completion rate is given by  $-7.20 + 1.11 * (\log \text{ of GDP per capita}) + 0.08 * (\log \text{ of population density})$ , while the predicted infant survival rate is given by:  $-4.15 + 0.93 * (\log \text{ of GDP per capita}) + 0.11 * (\log \text{ of population density})$ .

## 6.2 Tracking underperformers over time

Another extension to this approach is to estimate the underlying regressions over a succession of years rather than just in one particular year. One can then observe whether the countries which are underperforming in the most recent year have also been underperforming in previous years. This indicates whether any recent underperformance in a relevant indicator has been getting relatively better or worse over time, or has remained about the same over time.

The results of applying this procedure to gross and net secondary enrolments rates are shown below. Table 6.3 shows the results of a basic cross-country regression of GDP per capita and population density on gross and net secondary enrolment rates. On the basis of these results, one can again identify countries whose levels of secondary school enrolment are much lower than expected. These are listed in Table 6.4. Figures 6.3 and 6.4 then show how the extent of underperformance in each of the countries listed in Table 6.2 changed over the period 1999-2002. This particular period is chosen mainly because of data availability.<sup>21</sup>

There is a fair amount of variation in the patterns across countries, but the main finding is that for most countries shown, the extent of underperformance has been rising over time, indicated by downward sloping lines in each figure. Only for a minority of countries has the extent of underperformance been falling over time, indicated by upward sloping lines in each figure. These are Guatemala and Vanuatu in the case of gross secondary enrolment, and Costa Rica, Guinea, Guatemala, Namibia and Uganda in the case of net secondary enrolment.

<sup>21</sup> In the World Bank's *World Development Indicators*, most countries have data on gross and net secondary enrolment rates between 1999 and 2002, but before that most countries do not have data until we go back to 1991 (see Appendix 8).

**Table 6.3 Effects of log GDP per capita and population density on secondary enrolment, 2002**

	Secondary enrolment, gross	Secondary enrolment, net
Constant	-1.39	-1.04
- p-value	<0.01	<0.01
Log GDP per capita	0.25	0.19
- p-value	<0.01	<0.01
Log population density	-0.01	0.09
- p-value	0.77	0.44
R <sup>2</sup>	0.67	0.65
No. of countries	137	112

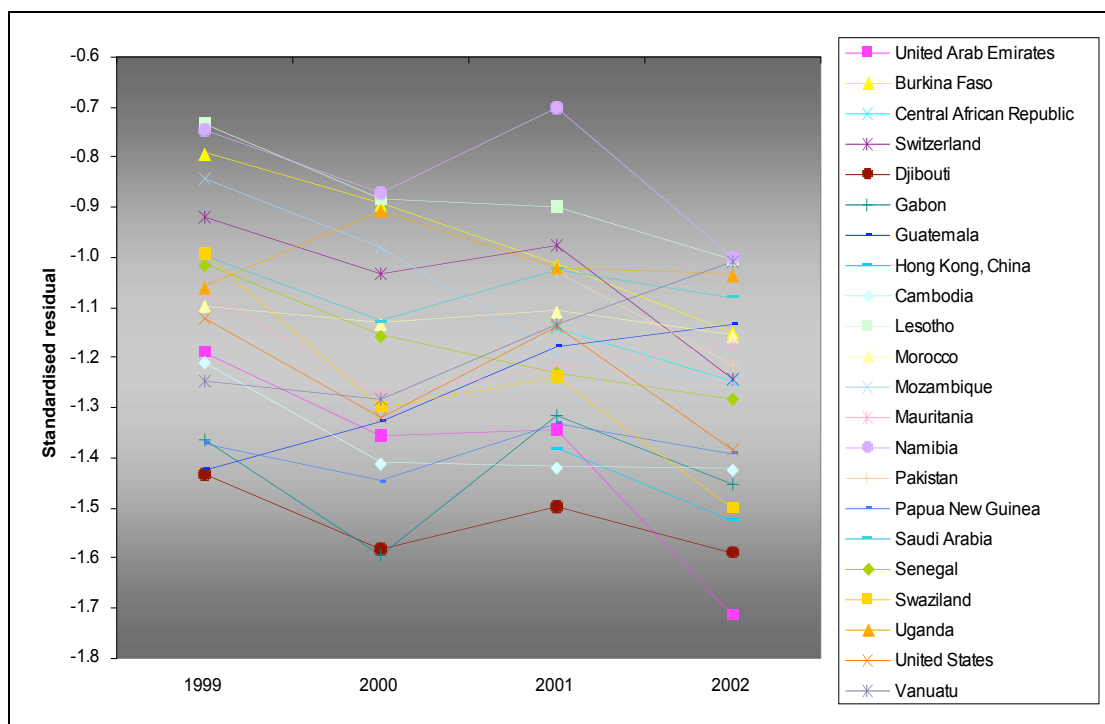
Notes: Data refer to 2002. For full definition of enrolment variables see Appendix 8.

**Table 6.4 Underperformers in secondary enrolment controlling for GDP per capita and population density, 2002**

Gross secondary enrolment		Net secondary enrolment	
Namibia	Central African Rep.	Chad	Cambodia
Lesotho	Mozambique	Niger	Hong Kong, China
Vanuatu	Senegal	Cote d'Ivoire	Guinea
Uganda	United States	Costa Rica	Lesotho
Saudi Arabia	Papua New Guinea	Uganda	Mozambique
Guatemala	Cambodia	Namibia	Djibouti
Burkina Faso	Gabon	Saudi Arabia	Guatemala
Morocco	Swaziland	United Arab Emirates	Dominican Republic
Mauritania	Hong Kong, China	Mauritania	Swaziland
Pakistan	Djibouti	Morocco	
Switzerland	United Arab Emirates	Burkina Faso	

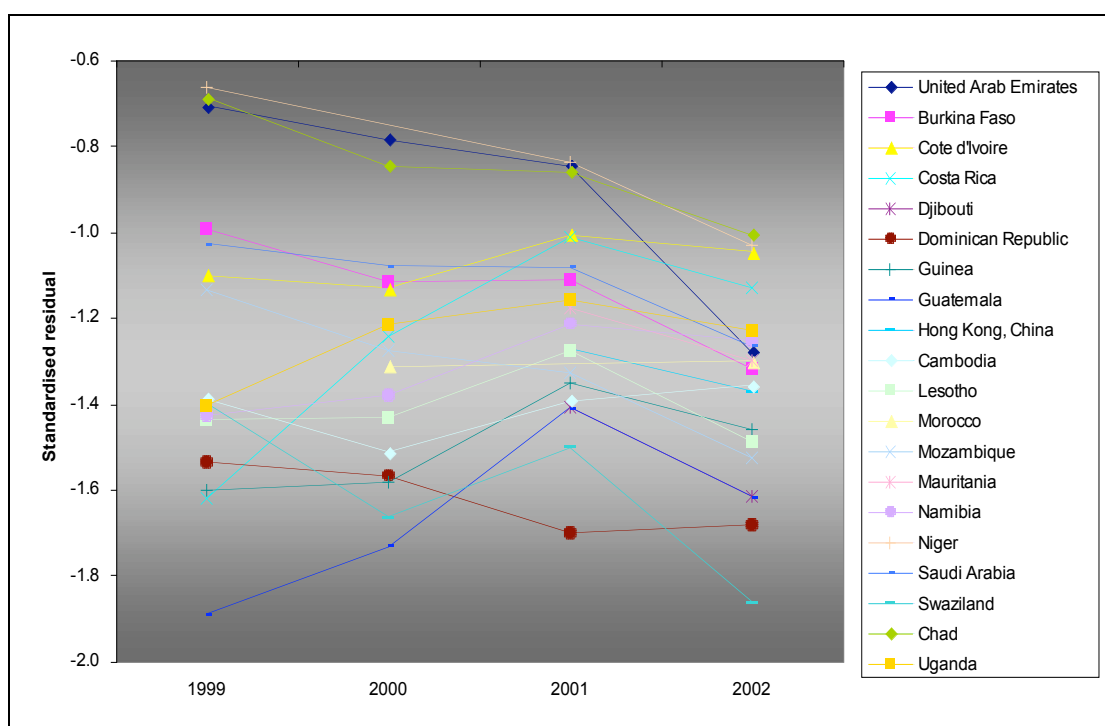
Note: All countries have residuals from the regressions reported in Table 6.3 which are more than one standard deviation below the mean.

**Figure 6.3 Tracking underperformers in gross secondary enrolment, 1999–2002**



*Note:* The standardised residual is the residual expressed in terms of standard deviations from the mean.

**Figure 6.4 Tracking underperformers in net secondary enrolment, 1999–2002**



*Note:* The standardised residual is the residual expressed in terms of standard deviations from the mean.

### 6.3 *Identifying underperformers in terms of trends*

Another approach is to compare the increases in relevant health or education indicators over time in one country against increases observed in other countries with similar rates of growth in available resources. The aim is to identify countries in which recent increases in relevant health or education indicators have been much smaller than expected, given the changes in available resources.

Expected increases in secondary enrolment resulting from increases in per capita GDP can be inferred from the results in Table 6.3. There, the estimated coefficients on GDP per capita suggest that, on average, the gross secondary enrolment rate rises by 0.25 percentage points for every 1% increase in GDP per capita, while the net secondary enrolment rises by 0.19 percentage points. Thus a country with a growth rate of 3% per year for 10 years would expect to raise the gross secondary enrolment rate by around 8 percentage points and the net secondary enrolment rate by around 6 percentage points.

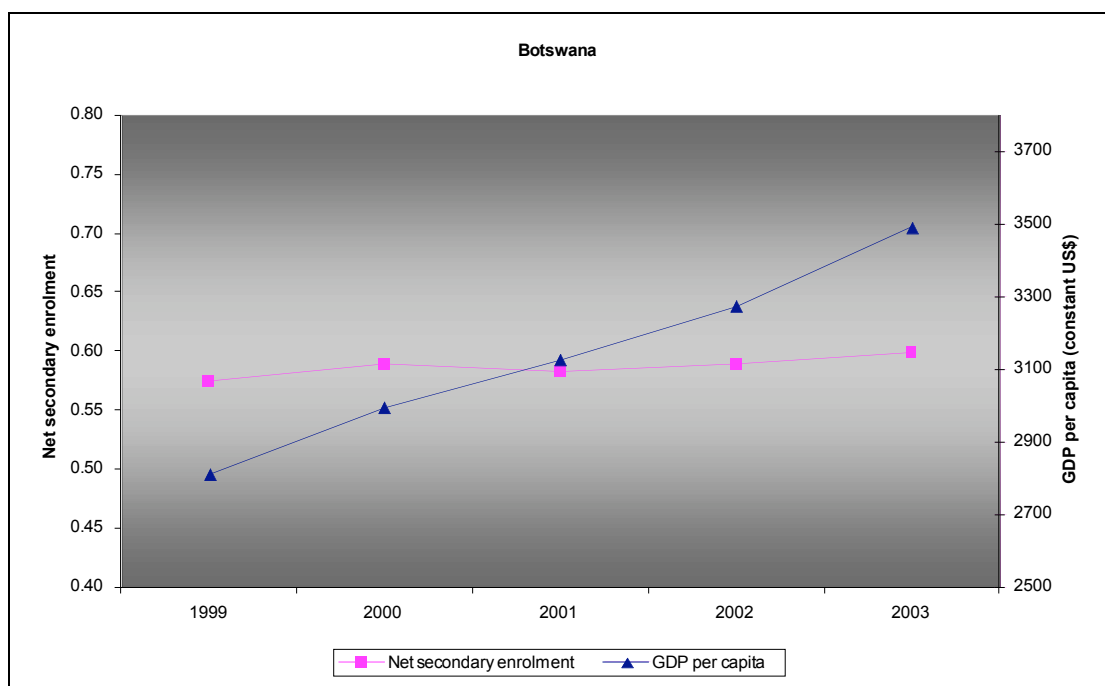
These results can in turn be used to identify countries in which actual increases in secondary enrolment are a long way below the increases one would expect, given their growth in GDP per capita. Two countries meeting this criterion over the period 1999–2002 are shown in Figures 6.5 and 6.6. The first is Botswana, with an increase in secondary enrolment over the period of approximately 2 percentage points. Given its rate of economic growth of around 5% per year however, one would expect an increase in secondary school enrolment of around 4 percentage points. The second country shown is South Korea, with in fact a reduction in secondary enrolment over the period, of around 8 percentage points. Given its rate of economic growth of nearly 5% per year, one would have expected an increase in secondary school enrolment of around 5 percentage points.

One possible extension of this approach is to estimate a cross-country regression in which the dependent variable is the change in secondary enrolment, and the explanatory variables are changes in GDP per capita and in any other variables thought to influence secondary enrolment. One can then use the results of this regression to identify countries which have seen lower than expected increases in secondary enrolment given the changes observed in the various explanatory variables. This approach should in theory generate very similar results to those shown in Table 6.3, although in practice it will often generate somewhat different results.<sup>22</sup>

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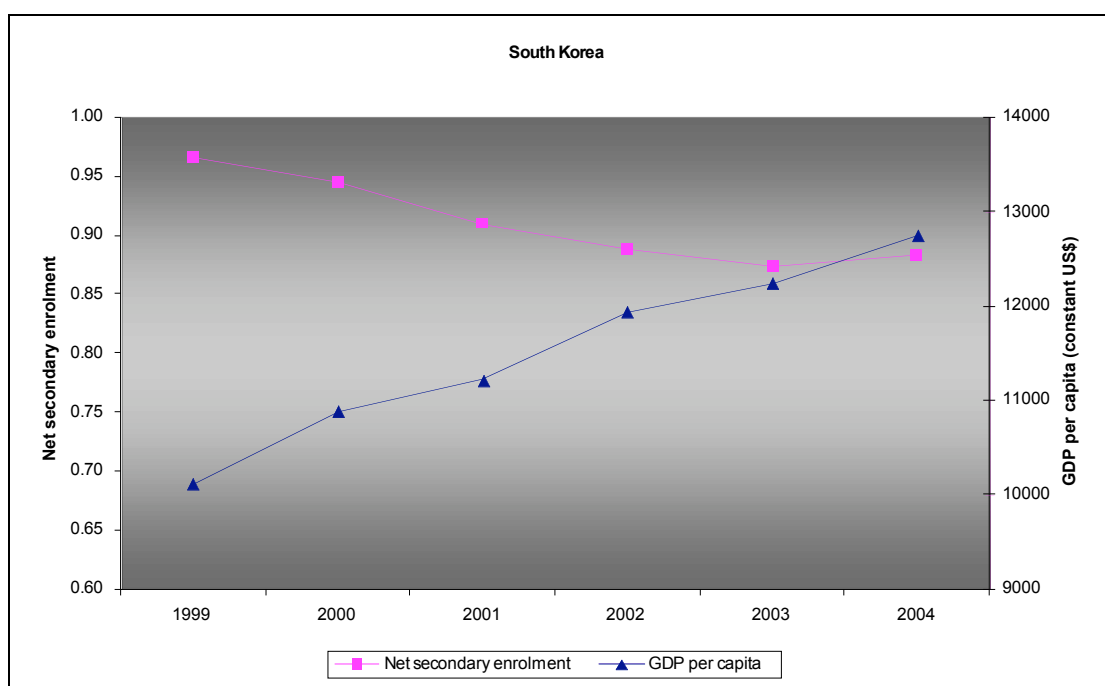
<sup>22</sup> There are various reasons why the results of estimating a cross-country regression in first differences (i.e. changes in the indicators over time) will differ from those obtained from a regression estimated in levels (i.e. levels of the indicators at a single point in time). One of the main reasons is that the former type of regression automatically controls for unobserved country-specific factors which can bias the results of regressions estimated in levels. This implies that the results of first-differenced regressions should be preferred over those from regressions in levels. The drawback with regressions estimated in first-differences is that levels of statistical significance are often considerably lower.

**Figure 6.5 Secondary enrolment and GDP per capita over time: Botswana**



Source: World Bank *World Development Indicators* 2006

**Figure 6.6 Secondary enrolment and GDP per capita over time: South Korea**



Source: World Bank *World Development Indicators* 2006

Another possible extension is to test for lags in the effect of different explanatory variables on health and education indicators. For example, increases in GDP may take time to translate into more schools and teachers, which could in turn take time to translate into higher school enrolment rates. Lag effects such as these can be investigated through regression analysis, but this has generally not been done in the empirical literature to date, at least that part using cross-country analysis.<sup>23</sup> Testing for lags does, however, make the regression analysis quite a bit more complex, and can only be done if data on the relevant health or education indicator are available on a regular basis (once every 1–2 years), which unfortunately is not the case for most health and education indicators contained in the World Bank's *World Development Indicators* (see Appendix 8).

#### 6.4 *Identifying underspenders*

A final approach is to compare the levels of important policy variables in one country with levels observed in other similar countries, and/or against some commonly accepted international benchmark. One such variable is the amount that the government spends on basic health and education and related welfare sectors (e.g. clean water and sanitation).

The UNDP has in the past referred to these sectors of government expenditure as 'human priority' sectors (e.g. UNDP 1991, 1996). It has also shown how the amount a government spends on these sectors, as a proportion of GDP or GNP, can be decomposed into three different expenditure ratios, namely:

- the public expenditure ratio: government expenditure as a proportion of GDP;
- the social allocation ratio: government expenditure on social sectors (e.g. health, education, social protection, plus certain others) as a proportion of total government expenditure;
- the social priority ratio: government expenditure on human priority sectors (e.g. primary health care and primary education), as a proportion of total government expenditure on social services.

By multiplying these three ratios together, one obtains the human expenditure ratio: government expenditure on human priority sectors as a proportion of GDP. The UNDP has also provided certain benchmarks or guidelines about what the levels of these three ratios should be (or should not fall below), namely: 25% for the public expenditure ratio, 40% for the social allocation ratio, and 50% for the social priority ratio, leading to a human expenditure ratio of 5% (UNDP 1991).

It has been proposed by recent authors that these benchmarks can be used to assess whether or not governments are complying with their human rights obligations (e.g. Diokno 1999, referenced in Elson 2006).

#### 6.5 *Links to the methodology*

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<sup>23</sup> The only reference to this is in a PhD dissertation written in 1997, referenced in Or (2000). There is evidence on the lags between inequality and health, but these are typically single-country studies, mainly of the United States.

The approaches outlined in this section provide useful means of identifying countries in which there is a greater chance that the application of the methodology outlined in Section 3 will generate the conclusion that the government is not complying with its obligations. All methods are relevant and can be applied, with any countries identified by each different approach being those in which there is perhaps the greatest chance that the application of the methodology will generate this conclusion. However, none of these methods represent evidence as to whether or not a government is complying with its obligations. This is for two main reasons.

The first reason relates to the evidence on underperformance in levels of relevant health and education indicators. In the multiple regressions underlying this technique, some of the variables used to proxy for a country's available resources (or constraints) are, at least partially, under governments' influence (e.g. the rate of economic growth). These should therefore be part of the assessment.

In principle, it might be possible to net out the influences of government influence on proxy measures for available resources.<sup>24</sup> However, even if we were to do this, we would still be uncertain as to whether any difference between the observed and expected level of a health or education indicator necessarily implies a lack of government effort and that the government is failing to comply with its obligations. Instead, such a difference could still be due to:

- measurement error in the health or education indicator: for instance, there could be some bias in household survey methods which cause a country's reported infant survival rate to be lower than its true rate;
- unobserved influences on the health or education indicator: for example, infant mortality rates are likely to be affected by the cost of health inputs (e.g. medicines, salaries for doctors and nurses etc.), but this sort of information is difficult to collect on a consistent basis for a large number of countries;
- country-specific factors: although there may be an average relationship between a health or education indicator and a set of explanatory variables across a large number of countries, we cannot necessarily assume that the same relationship applies in each and every country context.

Unfortunately, there is no way of assessing whether any difference between the observed and expected level of a health or education indicator reflects a lack of government effort, as opposed to one (or more) of these three things. This means that evidence on the underperformance of countries in relevant health or education indicators cannot be used as evidence of whether a country is complying with

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<sup>24</sup> For example, one could calculate each country's expected rate of growth in GDP per capita over some period. These estimates could be obtained from a cross-country regression in which the dependent variable is the rate of growth in GDP per capita, and the explanatory variables include the initial level of GDP per capita at the time a government takes office, as well as external influences such as terms of trade shocks. Various econometric studies of the determinants of economic growth are available and could be used, one of the best references being Barro and Sala-i-Martin (2005). The expected rates of economic growth could then be used, rather than countries' actual growth rates, when calculating expected increases in relevant health or education indicators.

obligations under the ICESCR. This is not to say that multiple regression analysis of health and education indicators does not serve an important function, but its use should be limited to identifying the actions a government can take in order to promote levels of realisation of the right to health or education (as in Section 3).

The second reason relates to the levels of so-called policy variables, such as the amount the government spends on basic health and education (see Section 4.5). In principle, it would be possible to calculate the optimal level of a particular policy variable in terms of maximising the level of a relevant health or education indicator, given the constraints a government faces. For example, one could in principle calculate the optimal amount of government spending on basic health care, as a share of GDP, from the point of view of bringing about the highest possible reduction per year in the infant mortality rate, given the total amount of revenue the government has available.

Even if this could be done, however (which is questionable given the demanding data requirements), it is doubtful that the results would be of use to monitoring compliance with the ICESCR. This is for three main reasons:

- first, it is unlikely that the optimal levels of expenditure would be the same in all countries, because of differences across countries in the need for health and education interventions, the cost of those interventions, and the cost of raising the necessary public revenue;
- second, even if the optimal level of expenditure were similar in most countries, its level need not equal the average or typical level of the policy variable actually observed among any group of countries;
- third, even if the optimal level of expenditure was given (roughly) by the average level observed among countries, there are legitimate trade-offs, meaning that one country may legitimately choose a lower-than-average level of one particular policy variable (e.g. spending on primary education) in order to further progress towards some other legitimate objective.

For these reasons therefore, the international benchmark figures provided by UNDP (1991) for public expenditure on human priority sectors cannot be used as a means of assessing whether a government is complying with its obligations under the ICESCR. This is not to say that the amount that a government spends on different sectors is unimportant; it is just that such information does not provide a means of monitoring government compliance with the ICESCR in itself.<sup>25</sup>

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<sup>25</sup> Some governments have in the recent past (e.g. the UNDP 20:20 initiative) made commitments to spend a certain share of their resources on basic health and education, and adherence to these commitments can clearly be assessed simply by comparing actual levels of expenditure with the amounts to which governments have committed to. However, such commitments differ from the type of obligations set out in the ICESCR, which on the whole make no mention of a required level of any one policy variable.



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