Assessing health system performance in developing countries: A review of the literature

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Abstract

With the setting of ambitious international health goals and an influx of additional development assistance for health, there is growing interest in assessing the performance of health systems in developing countries. This paper proposes a framework for the assessment of health system performance and reviews the literature on indicators currently in use to measure performance using online medical and public health databases. This was complemented by a review of relevant books and reports in the grey literature. The indicators were organized into three categories: effectiveness, equity, and efficiency. Measures of health system effectiveness were improvement in health status, access to and quality of care and, increasingly, patient satisfaction. Measures of equity included access and quality of care for disadvantaged groups together with fair financing, risk protection and accountability. Measures of efficiency were appropriate levels of funding, the cost-effectiveness of interventions, and effective administration. This framework and review of indicators may be helpful to health policy makers interested in assessing the effects of different policies, expenditures, and organizational structures on health outputs and outcomes in developing countries.

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Keywords: Health systems; Health indicators; Health metrics; Health system performance; Developing countries

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1. Introduction

The past decade has witnessed a renaissance of interest in health systems in academic discourse and policy dialogue within the development community. After 20 years of neglect in favor of vertical health programs, community-based small-scale projects, and donor-directed thematic health investments, strong health systems are again seen by policy makers and donors as essential to achieving and sustaining health gains [1–3]. This has been in part stimulated by the Millennium Development Goals that call for the achievement of several health targets simultaneously by 2015—difficult if not impossible to achieve without functioning health systems.

We begin with the WHO [4] definition of health system: “all the activities whose primary purpose is to promote, restore, or maintain health” but narrow it down to those activities, which are under complete or partial control of governments, as governments are the primary funders and in many cases providers of health services in developing countries. These activities range from direct service provision through public sector clinics and hospitals, to population-level public health activities to funding community-level health education. The private sector in health is not excluded from consideration, however, as governments play an important regulatory role that can influence the performance of private providers.

Assessing the performance of a health system begins with defining its goals. While there is an ongoing debate on the ultimate aims of a health system, we follow the World Health Organization and define the goal of a health system to be the delivery of effective preventive and curative health services to the full population, equitably and efficiently, while protecting individuals from catastrophic health care costs [4]. The concept of the communitarian underpinnings of health systems was well captured by the UN’s Committee on Economic Social and Cultural Rights, which noted that states are obligated to ensure availability, accessibility, acceptability, and quality of health services [5]. As core social institutions, health systems also need to be responsive to the needs and demands of the population [6]. For example, in a democratic society claims to health services and conditions that promote health can be seen as assets of citizenship [7]. Thus we would include patient satisfaction, public participation in decision making, and accountability as key aims of health systems, distinct from the clinical and economic goals. These goals are similar in developed and developing countries, although developing country governments whose health budgets are highly constrained are generally expected to deliver essential rather than comprehensive health services [8]. Essential health services are those that address the major contributors to death and disability in countries, ranging from child and maternal health services to prevention and treatment of infectious diseases to basic response to injuries and chronic disease.

Indicators of health system performance cannot be seen in isolation from their ultimate purpose and from issues of measurement. Governments need tools to monitor and evaluate the functioning of the system on a routine basis and to allow for more informed decisions about health systems funding, organization and policies. Performance indicators are also important to donor countries who want to document effective use of official development assistance for health and to researchers who generate evidence relevant to health system scale-up and reform. While a full discussion of the selection and measurement of indicators is beyond

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the scope of this paper, metrics need to be locally relevant, reliable and valid as well as feasible to implement. Process indicators should be causally linked to outcomes and sensitive to change in policy. Developed and developing countries may thus adopt very different indicators in measuring the performance of health systems and different indicators may be relevant depending on the unit of analysis (e.g., facility, district, nation). There are now several major initiatives to standardize and harmonize the collection of health metrics globally and to make recommendations on the most useful measures. These include the UN’s Interagency Group on Indicators that recommends measures to track progress on the Millennium Development Goals across countries, the WHO-based Health Metrics Network that is helping countries to develop health information systems, and a new research Institute for Health Metrics and Evaluation at the University of Washington, among others [9–11].

This paper presents a systematic literature review of health system performance indicators or measures currently being used in the field, with a focus on developing countries. Given the complex and locally specific nature of health systems and the corresponding need to customize indicators for different settings, we did not set out to compare the quality or feasibility of the indicators reviewed here, which span many countries. Rather, in this review, we describe the indicators that have been applied in the field to measure health system performance and highlight those indicators that were found to be in most common use.

To organize this review, and based on the definition of the goals of a health system discussed above, we created a framework for health systems performance (see Fig. 1). The three major dimensions of performance in our framework are effectiveness, equity, and efficiency and the inputs are policies, funding and organization. This framework is informed by extensive

![Fig. 1. Framework for health systems performance measures.](image-url)
previous work on defining key elements of health system performance in both developed and developing countries [4,5,12–16]. Because the systematic literature review focuses on indicators for health system effects (outputs and outcomes) rather than health system inputs, the discussion below deals primarily with the outputs/processes and outcomes/impacts of health systems.

2. Methods

We performed a literature review of all literature in English published since 1995 using the search terms “health system effectiveness” “health system equity”, “health system efficiency” in combination with “indicators”, “measures” and “metrics”. We searched the following databases: PUBMED, Medline, ELDIS, the World Bank library, WHO library, ID-21, EMBASE, and the Cochrane library. We also reviewed key articles, conference publications, and texts that were not included in the database search through discussion with experts and by consulting the reference lists of the papers identified.

Two types of articles were selected for review. The first were conceptual papers on health system performance measurement, which we used to assist us in formulating our conceptual framework. The second set of papers selected discussed actual indicators in use in developing and to a lesser extent, developed countries. The latter articles either assessed indicators used to measure the impact of health policy changes in countries and reforms or reported on direct trials of measurement tools. While we include major reviews or large cross-national comparisons from Europe, North America and other parts of the developed world, we were especially interested in research based in developing countries. All publications meeting these criteria were reviewed independently by two investigators for inclusion in the review.

3. Results

Our initial screen resulted in 685 peer-reviewed publications from PUBMED and 168 publications from the other databases including those published by multilateral organizations such as the United Nations, the World Bank, and the European Union, by bilateral aid organizations as well as by academic institutions and civil society.

Most of the publications identified through the search reported the results of health system reforms or evaluated specific health programs rather than examining the measures used for evaluation. For example, given our focus on the measures used rather than the result of health reforms, we did not do a detailed review of the many papers examining the impact of reforms in health policy and financing around the world. Only studies that gave examples of actual application of the indicators in the field were included in the review. Selected for final review were 118 papers on health system effectiveness, 90 on equity, and 97 dealing with efficiency. The indicators identified are summarized in Table 1. The indicators most commonly used in developing countries are indicated in bold type.

4. Discussion

4.1. Effectiveness

For the individual patient an effective health system provides timely access to the full array of needed services, efficacious and safe care leading to improvement in health, continuity of care, and respect [4,12,14]. While in theory these effectiveness characteristics are relevant across countries, in developed countries with comprehensive health insurance and universal or near-universal access to basic services, aggregate access and continuity are measured less frequently than access for disadvantaged groups, quality, safety, equity, and patient satisfaction. However, in developing countries access to even basic services is still one of the major barriers to better health for much of the population and is thus a focus for policy makers and analysts [15,16]. Curiously, WHO excluded measures of access from its analysis of health system performance [4]. Technical efficacy, safety, and continuity are variously included in the term “quality” by some analysts, whereas others use quality synonymously with effectiveness. The review found that the patient’s experience of health care, expressed as patient satisfaction, is used as an outcome indicator of the effectiveness or quality of health systems—particularly in developed countries where long life expectancies and generally favorable health
<table>
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<tr>
<th>Performance dimension</th>
<th>Category</th>
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| Effectiveness (outcomes) | Health status | • Infant mortality
• Maternal mortality
• Neonatal mortality
• Incidence of low birth weight
• Survival rates for lung cancer
| Patient satisfaction | • Being treated with respect
• Quality of physician-patient communication
• Length of wait for care
• Administrative simplicity
• Perception of access to specialists
• Adequacy of time spent with physician |
| Effectiveness (outputs) | Access to care | Availability
• Physicians, nurses, hospitals per 1000 population
• Basic and comprehensive emergency obstetric care facilities per 500,000 population
• Percentage of population within 10 km of a clinic
• Referral rates for women with obstetric complications
| Utilization | • TB case detection rates
• Antiretroviral treatment rates for people with advanced HIV infection
• Rates of sleeping under malaria bed net (under-5)
• Contraceptive coverage
• Pregnant women receiving four antenatal care visits
• Deliveries assisted by a skilled birth attendant
• Full basic immunization rates
• Screening for breast, cervical cancer
| Timeliness | • Effective treatment for malaria within 24 h
• Rapid treatment for delivery complications
• Avoidable hospitalizations |
| Quality of care | Efficacy | • Use of evidence-based diagnostics and therapies (Hb A1C for diabetes, aspirin for myocardial infarction, correct antibiotic for community acquired pneumonia)
• Correct prescribing (dosage, duration)
• Readmission rates
| Safety | • Rate of emergency room visits within 30 days of discharge
• Rate of avoidable hospitalizations |
| Equity (outcomes) | Health status (disadvantaged groups) | • Mortality rates for lowest income quintile (under-five, 15–49, maternal, cancer)
• Mortality rates for women, immigrants, members of ethnic groups, people in remote geographic area |
Table 1 (Continued)

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<th>Category</th>
<th>Sample indicators</th>
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<td>• Proportion of government health financing that reaches the poorest income quintile</td>
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<td>• Progressivity of financing methods (tax, out-of-pocket)</td>
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<td>• Extent of out-of-pocket payments, indirect payments and informal fees for essential services</td>
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<td>Risk protection</td>
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<td>• Proportion of population with catastrophic health expenditures</td>
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<td>• Incidence of impoverishment as a result of health payments</td>
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<td>Equity (outputs)</td>
<td>Access (disadvantaged groups)</td>
<td>• Distance from clinic for disadvantaged populations</td>
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<td>• Utilization of essential health services by disadvantaged groups (e.g., attended delivery, modern contraceptives, specialist visits)</td>
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<td>Quality (disadvantaged groups)</td>
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<td>Efficiency (outputs)</td>
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<td>• Costs per case treated (per hospital day, per outpatient visit)</td>
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<td>• Cost-effectiveness ratios for specific services (compared to alternative services)</td>
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<td>Administrative efficiency</td>
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<td>• Frequency of supervision, training</td>
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indicators make measurement of the health system’s impact on health outcomes difficult. Thus the components of effectiveness we focus on are: health status and patient satisfaction (outcomes) and access and quality of care (outputs).

4.1.1. Health status

From a population perspective, the sine qua non of an effective health system is an improvement in the nation’s health status, although this can be difficult to document in low mortality settings where premature mortality is low [17]. Health outcomes chosen to demonstrate the effectiveness of a health system should ideally be ones that are most amenable to improvement through the actions of the health system, rather than through access to exogenous factors such as clean water and education, although the various health determinants are difficult to disentangle. Examples of health outcomes frequently selected by developing countries include: infant mortality, maternal mortality, perinatal/neonatal mortality, low birth weight, and incidence of infectious diseases (see for example the Millennium Development Goals [18]). Developed countries add indicators such as survival rates from different types of cancers, although this can also be seen as a measure of the quality of care [19].

4.1.2. Patient satisfaction

Patient satisfaction with the health system has been extensively studied in industrialized countries. In countries where health systems are largely funded through tax revenue or where access to health is guaranteed by the constitution, surveys of patient satisfaction can
give the population an opportunity to express its opinion about an important social program and hence about the ability of government to deliver on a key obligation. For example, health system performance is a key part of election year debate in countries such as Canada and Britain [20,21].

Some health system features important to patients identified by American researchers studying army dependents included: caring behavior, provider competence, being treated with respect (“like I matter”), bedside manner, good information sharing, efficient care process, and administrative simplicity of health insurance [22]. A review of published studies of patient satisfaction identified several common criteria: patient-centered care, access, communication and information, courtesy and emotional support, technical quality, efficiency of care, and structure and facilities [23]. Patient satisfaction is thus an important independent measure of the success of a health system. A team from Harvard has been studying public perception of health systems in five countries since 1988 [24,25]. Adults in Australia, Canada, New Zealand, the United Kingdom, and the United States were asked whether their health systems needed minor change, fundamental change or a complete rebuilding as well as questions about access to needed care, access to specialists, the affordability of care (out-of-pocket payments), and quality [25]. This last variable encompassed questions on overall quality of health services, time spent with physicians, adequacy of the time spent with physicians, quality of their hospital experience, and adequacy of the hospital length of stay [25]. By retaining the same core questions over the years, researchers were able to track trends in public opinion (for example, Canadians have become increasingly dissatisfied with their health system since 1988). The study design also permitted subgroup analysis, such as the views of the elderly and low income people [24]. Developing countries have also begun to measure public satisfaction with health systems. Mexican patients were asked to rate two parallel health systems based on whether the staff was able to solve their health problem, respected their traditions, spoke their language, was friendly, and provided overall good quality of health service [26].

4.1.3. Access (availability, utilization, timeliness)

Population coverage with essential health services is a commonly used measure of access. Service coverage is an example of an output indicator—a proximate measure of the quantity of goods and services produced and used, whereas improved health indicators are an outcome (or impact) measure. Access to and population coverage of services are two sides of the same coin—seen from an individual and a population perspective, respectively. Access has at least three components—availability, utilization and timeliness. Availability of services is a process indicator linked to the policies, funding levels and organizational arrangements in each country. Availability is reported as the level of inputs (physicians, nurses, hospitals, clinics) per population or within a geographic area. Thus, the UN process indicators for emergency obstetric care ask countries to report functioning basic and comprehensive emergency obstetric care facilities per 500,000 population [27–30] and countries routinely report the percentage of population within 5 or 10 km of a health clinic. Physician and nurse to population ratios have recently taken on new importance in light of recent work suggesting health worker density has an important impact on improving certain health outcomes, and the quality of this data is improving [31]. Related to availability is organizational access – that is the presence or absence of structural/systemic barriers to care – such as lack of referral to the appropriate level of care (even when it is available) [32]. Financial barriers to access are discussed in Section 4.2, as they affect poor segments of the population disproportionately.

An OECD review found that industrialized countries commonly use utilization of screening tests such as those for breast and cervical cancer as measures of access to (and equity of) services [19]. Utilization of services thus becomes a proxy for access. In the developing world, utilization indicators have assumed a greater importance with the introduction in 2000 of the Millennium Development Goals, which have encouraged countries to set targets for and report access to health services to demonstrate progress on reaching the MDGs [33]. Perhaps the most well-known recent utilization target is WHO’s 3 × 5 initiative, which promised to place 3 million people on antiretrovirals by the end of 2005 [34]. Other examples of commonly used utilization indicators are: case detection rates for TB, use of malaria bed-nets, access to antimalarials within 24 h of onset of symptoms, contraceptive coverage, antenatal care attendance (and specific antenatal services such as
tetanus immunization), attended deliveries, availability of basic and comprehensive emergency obstetric care (EmOC) facilities, immunization rates, and availability of essential drugs [1,35,36]. Again, there is considerable debate about how well some of these indicators proxy potential gains in health. For example, antenatal care and currently available immunizations do not have large impacts on reducing the overall mortality of mothers and children, respectively, yet they are among the most commonly reported access indicators [1]. The notion of timely access is increasingly being recognized as an important feature of access although indicators to measure this are few in the developing world [14]. Timely access is essential to save lives in some conditions (e.g., for malaria, birth complications, acute myocardial infarction) and to minimize suffering and disability in others (e.g., chronic illness). Thus, the effectiveness treatment for malaria is assessed through the provision of appropriate medicines within 24 h of the onset of symptoms [37]. Avoidable hospitalizations for selected conditions can also indicate problems in access to timely preventive and primary care [19].

4.1.4. Quality of care (efficacy, safety, continuity)

Perhaps the most researched component of effectiveness is quality of care—in its broadest sense. While there is no single definition of quality, the frequently cited Institute of Medicine’s definition is health care that is safe, effective, patient-centered, timely, efficient, and equitable. Some of these components are included elsewhere in our framework; in this section we will focus on efficacy, safety and continuity. This last indicator was suggested by Judith Bruce who adapted Donabedian’s quality framework and we include it here to measure an important dimension of the process of providing care [38]. Indicators for quality of care abound, particularly in developed countries. Measures of quality of care for children in the US include indicators of safety, effectiveness, patient-centeredness, and timeliness [39]. Canadian researchers evaluating the quality of surgical interventions suggest assessing the rate of deaths within 30 days of admission, rate of readmission within 30 days of discharge, rate of emergency room visits within 30 days of discharge, rate of and satisfaction with use of home care services, and rate of avoidable hospital visits and admissions [40]. Similarly, American researchers use admission rates for preventable pediatric conditions such as bronchitis, asthma, gastroenteritis to assess the quality of primary pediatric care in one community in Iowa [41]. Another approach to measuring quality is to designate certain types of care as indicative of quality and measure their frequency in selected patient populations. For example, European researchers identified 34 indicators of process quality (defined as medical care based on best scientific evidence) for 11 diagnoses and treatments from review of the literature, such as annual testing for hemoglobin A1C in diabetes and use of aspirin in acute myocardial infarction [42].

Measurement of quality in developing countries is accelerating with the introduction of new health programs that are intended for national scale-up. Researchers evaluating the effectiveness of the Integrated Management of Childhood Illness (IMCI) constructed a single aggregate measure of technical quality of care comprised of prescribing the correct drug, prescribing it correctly (dosage, timing, duration of treatment) and explaining the treatment to the patient [43]. The quality was assessed by a “gold-standard surveyor”, a researcher trained in the appropriate treatment of the presenting conditions. More detailed assessments of assessment, diagnostic, and triage skills were also described in the IMCI evaluation in Tanzania [44]. IMCI’s evaluation also illustrates the linkages between output indicators such as utilization and quality and the final health outcome of interest. In the national evaluation of the impacts of the IMCI program in Peru, researchers evaluated outpatient utilization of IMCI services and vaccine coverage of the population (output indicators) and nutritional status and child mortality rates (outcome/impact indicators) [17]. IMCI researchers in Tanzania compared the child mortality rate in IMCI and non-IMCI districts, finding that that the indicator was sensitive enough to measure the impact of IMCI even within 2 years of implementation [45].

Another aspect of care quality is appropriate referral for complicated cases. Appropriate referral requires recognition of a complication beyond the capacity of the initial provider/facility and a functioning transport and communication system—all components of a well functioning health system. A team in Zambia evaluated the appropriateness of referral for emergency obstetric care for pregnant and laboring women in Lusaka by examining reasons for referral, timing of referral, percentage of Caesarean section, and case fatality
Continuity of care, which can be defined as the completion of the full treatment course or continued access to care for chronic conditions, is an important aspect of technical quality. Continuity of care can be measured through the number of repeat visits for a prolonged or chronic condition (e.g., antenatal care in pregnancy, antiretroviral care for AIDS) or completion of a course of treatment (e.g., directly observed treatment—short-course or DOTS for TB, antimalarials) [47–49]. Safety of care is another important dimension of quality. Safety data tends to be collected through facilities. Examples of safety indicators are infection and complication rates of surgery, case fatality rates, rates of hip fractures in facilities, and readmission rates within 28 days [19,28].

4.2. Equity

Achieving equity in health requires eliminating health disparities that are avoidable and unfair such as those due to inadequate access to services, unhealthy living or working conditions, or downward social mobility caused by ill health [50]. These disparities are often associated with social advantage or disadvantage as manifested through wealth, gender, race, or ethnicity and therefore any measurement of equity must capture these dimensions [51]. Improving equity may require a greater commitment to improve the health status of the poor—not necessarily linked to achieving aggregate gains [52]. Indeed, increasingly policy experts urge governments to adopt explicit pro-poor health policies and measure their health system success by assessing impact on the poor, rather than the entire population, to reverse the regressive nature of health care delivery in many developing countries [53,54].

Health systems are of course not the only determinants of improved health. Adequate and equitable access to education, clean water, food, and sanitation, as well as equality of opportunity and freedom from persecution, all contribute to reducing health inequities. However health systems are a powerful means for improving health equity within a country. The two central aspects of equity in health systems are equity in service delivery and equity in financing [55,56]. Thus health services should benefit users in proportion to need (rather than social status, for example) and financing for health services should be progressive, requiring proportionately less in contributions from those with lowest incomes [56]. This progressivity of financial contributions and the notion that people with greater health needs receive more care is also called “vertical equity” [57]. Equity in financing also includes protection for the poor from catastrophic health expenses. Health equity advocates add that public participation and accountability are both a means to achieving equity and in themselves end goals of an equitable system. Thus the sense of exclusion from the health care system, as commonly experienced by marginalized groups, deprives the system of an important voice in improving access and fair financing and is in itself an indicator of inequity [7,58]. We will now discuss equity in health status and access as well as financing and risk protection.

4.2.1. Equitable health status and access to care

A common approach to measuring equity in service delivery is to analyze the markers of effectiveness (comprehensiveness, access, quality, continuity, patient satisfaction, etc.) by income quintile, ethnicity, gender, geographic location or other social stratifiers [15,59–61]. Daniels et al. [16], for example, propose that countries define locally specific indicators to measure reductions in geographical maldistribution of services and supplies, elimination of gender, cultural and other non-financial barriers to access, and the provision of an appropriate basket of services. Such measurement may require the development of specific community-level surveys and other monitoring tools, for facility-based data will not reflect the experience of groups not accessing services. For evaluating the equity of the Swiss ambulatory health care system, Eggli et al. propose that access, effectiveness, and efficiency data be analyzed also for subsamples of people in poor health—either self-identified through surveys or through disabled insurance rolls [62]. Specific measures of equality in service delivery including utilization measures such as general practitioner, specialist, and hospital visits were analyzed with respect to variables on ethnicity, place of residence, education, income, and employment in Estonia [63]. In New Zealand, utilization analysis included spending on drugs and laboratory services as well as GP visits, which was regressed against Maori status and New Zealand specific measures of economic depriva-
In Pakistan, maternal health service access was measured with antenatal care visits, institutional births, and use of modern contraceptives analyzed by income quintile [65]. In Malaysia, the proportion of government health expenditures on the poorest quintile and outpatient facility use by the same quintile were monitored [66]. Costa Rican researchers evaluated equity of access by using GIS and national census data to measure distance from the nearest clinic and hospital of rural and economically disadvantaged communities [67]. This estimate of distance was adjusted for the type and size of the clinic to give a more accurate representation of supply of facilities. GIS is a promising approach to pinpointing areas where geographic barriers to access are highest. In Lao PDR, researchers used surveys to elicit barriers to care for groups of low socioeconomic status, identifying staff attitudes and procedural barriers as important disincentives for utilization [68].

4.2.2. Fair financing and risk protection

Measures of equitable financing were less described in the literature. The two most common methodologies involved some analysis of the distribution of government spending by income group (most often quintile) and the disincentive effects of user fees on access to services. National health accounts (NHA), a record of sources and uses of health system funds, are increasingly being used to assess progressivity of health financing methods (e.g., tax and out-of-pocket payments) and the distribution of government expenditures to different parts of the country and different social groups [55,69]. Out-of-pocket payments at the point of service, which are commonly levied and pose an important access barrier for the poor, are critical to estimate. Bangladeshi families, for example, incurred substantial out-of-pocket costs for travel, hospital admission fees, medicines, tests, food and tips, while accessing “free” maternity services in a public hospital in Dhaka [70].

The second component of fair financing is risk protection, that is protection from financial ruin due to catastrophic health expenses. The WHO [71] defines catastrophic expenses as those that demand 40% or more of the family’s capacity to pay (its effective income after basic subsistence needs have been met), whereas the World Bank [73] suggests a cutoff of 20% of all expenditures over a period. Others consider expenditures catastrophic when they put a family under the country’s poverty line. For poor families in developing countries such catastrophic expenses can result from prolonged hospitalization or treatment requiring transport to a distant hospital to relatively minor surgery that is accompanied by several levels of under-the-table payments. A commonly used indicator for the prevalence of catastrophic spending in a country is the proportion of households that encountered or are at risk of catastrophic expenses in a year [71,72].

4.3. Efficiency

Efficiency in health systems refers to extracting the greatest health gains from a set of inputs [71,73]. This embodies the concepts of technical and allocative efficiency as well as the less tangible but no less important administrative efficiency that includes the value of workers’ and patients’ time. Allocative efficiency refers to directing funds to activities that will maximize health gains. Technical efficiency is the highest possible sustained output obtained from a combination of resources (e.g., workers, drugs, equipment) [74]. Issues of cost and productivity of health inputs are central to a discussion of efficiency. However, extracting the most from resources implies that the health budgets are fundamentally adequate. In many developing countries, particularly in sub-Saharan Africa, government health budgets are less than US$ 20 per capita [75]—too low to provide even basic services, which the Commission on Macroeconomics and Health estimated would cost US$ 30–40 per capita [8]. Thus the size of the budget becomes in itself a determinant of efficiency (and effectiveness and equity). WHO researchers noted that while health outcomes generally improved with increasing health care expenditures, the sharpest rise in efficiency was at expenditures below approximately US$ 80 per capita, suggesting health systems do not work well below this threshold [76]. In addition to the magnitude of the budget, modes of financing can in themselves influence health system efficiency. For example, one study found that Western European countries with national (tax financed) health systems appear to be more efficient at producing lower infant mortality rates than countries with social security systems—in other words, produce better outcomes at lower costs [77]. The discussion below elaborates the concepts of technical/allocative efficiency and administrative efficiency.
4.3.1. Costs and productivity

Costs of service delivery underpin the notion of health system efficiency. Cost per case is a common measure that usually includes the drugs, personnel, diagnostics, hospital beds, surgical supplies and other recurrent costs for providing a full course of treatment for a condition. These costs can be allocated to various levels of the system—for example, national, district, facility, and household [43]. Importantly, out-of-pocket costs (including informal or under-the-table payments) need to be included in the cost calculation. Costs can also be expanded to include start up costs such as infrastructure, training, etc. This is particularly important in assessing the efficiency of interventions in developing country settings where significant up-front investments may be required to scale-up health service delivery.

Productivity of health care inputs is another window on efficiency. In comparing the performance of two branches of the Mexican health system, researchers assessed efficiency by evaluating process/output indicators such as physician consultations per day, hospital occupancy rates, and length of stay, as well as the number of contacts with the health system per person each year [26]. Given the large proportion of health budgets spent on hospitals, economies of scale and scope for hospitals can be calculated to assess their efficiency. Research in Vietnam, for example, demonstrated that provincial general and specialty hospitals were not as efficient as district hospitals in terms of their costs per case given their number of beds [78]. Similarly the costs per case for maternal health services in Uganda were higher when performed in hospitals versus health centers [79].

4.3.2. Administrative efficiency

While health system efficiency is often defined in purely economic terms, we would argue that efficient systems also maximize the value of health workers and the value of the patients’ time. Poorly managed and funded systems are marked by frustration, reduced performance, and eventually attrition of health workers, leading to reduced quality and eventually reduced demand for the services. Some markers of such organizational efficiency may be worker attrition rates, waiting times for appointments, availability of skilled personnel and drugs when needed, etc. Nigerian researchers attempted to tap into these dimensions of efficiency by auditing providers and managers in government and private primary health clinics on issues such as availability of updated operational plans and work schedules, regularity of team meetings, adequacy of facilities in terms of size and equipment, regularity of salary payments, availability of written job description, frequency of in-service training and overall level of worker motivation [35]. These are proximate markers for quality of management and overall system functioning. Poor system functioning will in part be reflected in outcome indicators such as higher per case costs, but will also impact other health system outcomes including utilization, patient satisfaction, and health outcomes.

5. Conclusion

Measuring health system performance is complicated by ongoing debates in the policy community about the purpose of health systems, the degree of impact of health care (versus other determinants) on health, and the nature of health care itself (public good versus market good). Still, most commentators agree that a well-performing health system is effective, equitable, and efficient. The literature presented here suggests the breadth of indicators available for measuring each of these components of performance. There were important limitations to our analysis. We restricted our search to literature since 1995 and to those published in English and thus may have missed some useful earlier experiences with the application of indicators in the field as well as those published in other languages. The scope of our study was limited to reporting the experience with indicators on the ground—we did not explicitly evaluate the quality or usefulness of each indicator beyond noting whether it appeared frequently in the literature (see Table 1). International and national bodies are actively engaged in studying and selecting indicators that are both good measures and feasible to apply in different settings.

Limitations considered, the framework proposed here, building on developments in health systems thinking over the past several decades, can be helpful for policy makers and researchers interested in capturing the key aspects of health system functioning. The framework used in concert with available data on the ground and informed by policy priorities could then guide the choice of indicators in the field to mea-
sure current performance of systems and the effects of change in policies, funding or organization. A common framework could also improve comparability of assessments done across different health systems.

Future research in this area should focus on understanding how these various indicators can be applied to different research and policy questions and to validating the indicators themselves. For instance, it would be important to elaborate a subset of indicators that can best capture short term effects of changes in policy or funding without being overly burdensome to apply. Linking specific process indicators to difficult-to-measure but crucial impact indicators, such as a reduction in maternal mortality or fair financing, is another area for further research. Lastly, there are relatively few indicators to capture the performance of health systems as a social institution. Operationalizing such notions as trust, accountability, and health worker motivation and, conversely, people’s experience of exclusion and abuse will be required to document this role of health systems.

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