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Disaggregating the Universal Coverage Cube: Putting Equity in the Picture

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Abstract—In recent years, the World Health Organization’s “Cube Diagram” has been widely used to illustrate the policy options in moving toward Universal Health Coverage. The Cube has become a globally recognized visual representation of health system reform choices, with its axes defined by: (1) the services covered by pooled funds, (2) the population covered, and (3) the proportion of costs covered. The Cube shows the difference between the current national coverage situation in a country and the policy goal of universal health coverage, identifying where major gaps exist. The essential feature of the Cube diagram is that it shows a country’s coverage situation in terms of national averages. As a result, it does not present or call attention to significant disparities in coverage across population groups, which are characteristic of most low- and middle-income countries. This article recommends adding a new diagram that disaggregates the Cube. The new diagram, called the Step Pyramid, allows a policy maker to visualize specific choices in expanding the coverage status of different population groups. This new diagram can help policy makers focus explicitly on equity concerns as they set priorities in moving toward universal health coverage. The paper explains how to construct a Step Pyramid diagram, provides a hypothetical illustration, and then uses data from Mexico to create an example of a Step Pyramid diagram. The paper concludes with a discussion of the strengths, limits, and implications of both the Cube and the Step Pyramid.

In recent years, the World Health Organization’s “Cube Diagram” has been widely used to illustrate the policy options in moving toward Universal Health Coverage (Fig. 1).¹ With its axes defined by (1) the services covered by pooled funds, (2) the population covered, and (3) the proportion of costs covered—the Cube has become a globally recognized visual representation of health system reform choices. The Cube shows the difference between the current national coverage situation in a country and the policy goal of universal health coverage, identifying where major gaps exist. However, the simplicity that makes the Cube an effective advocacy tool...
also limits its use for detailed policy analysis. In this paper we recommend adding a new diagram that disaggregates the Cube and thereby allows a nation to visualize its choices in expanding the coverage status of different population groups. This new diagram, we believe, can help nations focus more explicitly on equity concerns as they set priorities in moving toward universal health coverage (UHC).

THE LIMITS OF THE UNIVERSAL COVERAGE CUBE
The essential feature of the Cube diagram is that it shows a country’s coverage situation in terms of national averages. As a result, it does not present or call attention to significant disparities in coverage across population groups, which are characteristic of most low- and middle-income countries. For example, many countries have major social insurance plans for government and formal sector workers. These insurance plans, in addition to allowing their members some access to private providers, often operate their own distinct delivery systems. Meanwhile, farmers, fisherman, traders and others in the informal sector, as well as the unemployed, rely on a poorly functioning public sector that provides limited services and often requires substantial formal and informal copayments. As a result, lower income groups typically have lower coverage and fewer resources spent on their health care than those with higher incomes and better coverage. In South Africa, nearly half of total health expenditure goes to the top 15% of the population, which is enrolled in private health insurance plans.

In addition it is not unusual for lower income groups to spend a higher proportion of their income on health care costs, as compared to high income groups—even where there are supposedly free public services. This situation is evident in Egypt, where many low-income families resort to purchasing care in the private sector because of service and clinical quality concerns; they also spend substantial amounts on private-sector-supplied medicines. Indeed, even in systems that rely mostly on public provision, urban elites typically use a larger volume of, and more sophisticated, publicly provided health care than the rural poor. In this situation, the public system’s benefits are strongly pro-rich, as illustrated by the situation in China in the 1990s.

Policy makers seeking to move their countries toward UHC typically have to ask, “What expansions in coverage, for which groups, and for which services, should be our country’s next step?” These questions about the next steps in moving toward UHC involve complex issues of fairness and trade-offs that are not usually addressed in transparent or deliberative ways. Various indexes of inequality can be used to summarize a nation’s general situation. However, we believe that a visual diagram and the quantification of this gap, showing how health care financed by pooled resources varies by type of service and across different population groups, would help clarify and focus attention on the equity aspects of these decisions.

PUTTING EQUITY IN THE PICTURE
Our suggestion is to supplement the single cube (representing national averages) with a Step Pyramid diagram that visually depicts the different circumstances confronted by different population groups. This diagram can be constructed as follows.

First, divide the population into income groups (along the x-axis called population in Fig. 2). Deciding which income groups to distinguish is a pragmatic and empirical choice. How detailed an analysis is the pyramid builder...
trying to construct, and for which purposes? **Figure 2** shows three different income classes: top 20%, next 30%, and bottom 50%. These three groups are arbitrarily selected, to illustrate how coverage can differ by broad income classes. Alternatively, if data are available by insurance status, that variable could be used to divide the population into specific coverage groups. (The population should be disaggregated by insurance groups when significant portions of the population are covered by insurance plans; this often occurs in middle-income countries. For low-income countries, only a small portion of the population is covered by insurance plans; in those countries, it makes more sense to disaggregate the population by income groups.)

**Second, divide all health services into service segments** (the z-axis called *services* in Fig. 2). To create the relevant service segments we suggest dividing services by prevention, primary care, secondary care, and tertiary care. To make sure the segments in the diagram are policy relevant, analysts may assign specific services of interest to policy makers to different segments.

Once service segments have been defined, they can be arranged in inverse order of complexity. We propose putting basic primary care and prevention closest to the origin (which is in the far back corner), followed by coverage for outpatient medicines, secondary hospital care, and finally tertiary hospital care. This arrangement creates a pyramid shape for the final diagram, since coverage is likely to be highest for the most basic services.

What distance along the *services* axis should each service segment occupy? One option is to have the length of each segment represent that segment’s share in total health spending. But the purpose of the diagram is to illustrate the extent to which the current situation departs from national goals. And it is quite possible that the shares in current spending of the different segments are inconsistent with those policy priorities.

Instead, we propose a practical solution: to use as a reference point the spending pattern that the government would like to see enjoyed by all (as a policy goal). In some countries that might be what is spent on care for the nation’s best covered group—which would imply a goal of “leveling up” all citizens to that degree of coverage. In other countries, policy makers might decide that the best covered group is too ambitious, and therefore set another group’s spending as a more appropriate normative benchmark. This benchmarking of a goal is an essential decision for pyramid builders to make.

**Third, for each population group and service segment, determine the share of costs covered by pooled resources** (the y-axis called *costs covered* in Fig. 2). To calculate this share requires determining a benchmark against which the actual spending, for each service segment and for each population group, can be compared. The simplest solution is to reuse the same spending levels that were used to define the width of each service segment in the previous stage. So the height of each step becomes the ratio of the actual per capita pooled spending (for each population group, for each service segment) compared to the target level (as a policy goal). Groups that are totally uncovered for a given service are shown as having no “step” in that part of the diagram.

We should note that the category “covered by pooled resources” is more heterogeneous than is sometimes acknowledged. That term generally covers funding from social insurance schemes as well as tax-supported publicly provided services. But in systems with private insurance, such as in the US, the extent of pooling is much less, and the wide variation in insurance plans makes it difficult to determine the overall percentage of pooled resources. While social insurance systems in the US do cover the old and the poor, there is no redistribution across income groups for the large part of the population who are in employer-based, premium-financed schemes. Similarly, the distributive impact of different tax financing schemes can be quite varied. Unfortunately these variations—which have important equity implications—have to be ignored in constructing the kinds of diagrams we are discussing.

This last point, like several issues noted above (especially the measures of coverage compared to some ideal), underscores the challenges that arise in drawing a cube diagram for any actual national situation. Indeed, in order to calculate the national averages for the relevant magnitudes of the three axes likely requires first collecting the disaggregated data needed for the Step Pyramid diagram.

Thus for both the Cube and the Step Pyramid, there are important policy-related decisions that are inherent in any effort to construct an actual diagram. As a result, the diagrams for different countries may not be directly comparable, since they may choose different service segments, population groupings, or spending benchmarks. Both diagrams—and especially the more detailed step pyramid—have to be understood as goal-dependent within-country analytical tools, not as displays of “the only objective way to depict the situation.”

**Figure 2** shows a hypothetical Step Pyramid diagram that could be developed for a country using the methods we have just presented. In this diagram, primary health services have a higher proportion of costs covered by pooled resources, while more complex health services have a lower proportion covered by pooled resources; upper income groups have
higher coverage than the lower income groups. These hypothetical conditions create the relatively neat pyramid shape in the diagram. If a country had higher coverage for more complex services for some groups, or better coverage for some less well-off segments of society, the resulting diagram might not be a pyramid at all. Instead, it might well have multiple peaks and valleys rather than this simple shape.

Actually constructing a Step Pyramid diagram requires a substantial amount of national data on the financing and functioning of a health system. Besides the data from a National Health Account, the construction of a Step Pyramid diagram requires a reliable household expenditure survey that includes information on utilization, out-of-pocket spending by types of health service, insurance status, and income. Indeed, constructing a Step Pyramid can help reveal data gaps that are important to address in order to make informed choices about coverage expansion.

**AN EXAMPLE FROM MEXICO**

There are few examples in the published literature of a cube diagram that has been drawn for a specific country. One published example does exist for Mexico (in Spanish). In Figure 3 we have redrawn that diagram to be consistent with our presentation, using data on population coverage from a report on Mexico’s health system by a working group from the Mexican Health Foundation (FUNSALUD). This cube diagram combines Mexico’s three main health insurance programs into a single box. The three programs are: IMSS (the Mexican Social Security Institute), which covers private sector workers in formal employment (53 million people); ISSSTE (the Institute for Social Security and Services for State Workers), which covers public sector workers at the local state and federal levels (12 million people); and SPSS, known as Seguro Popular, which is a voluntary health insurance program meant to cover everyone else, with a defined benefit package for 278 conditions and 57 high-cost catastrophic conditions (52 million people). This diagram estimates the non-insured population at 15% of Mexicans in 2011. The FUNSALUD report arrived at this estimate by assessing the double-counting among these three health insurance programs (since some people are enrolled in IMSS or ISSSTE and also SPSS) in order to estimate non-insured. We use this estimate in our analysis (although it is worth noting that ENSANUT, Mexico’s national health and nutrition survey in 2012, used self-reported estimates in household interviews and found lower levels of enrollment in all insurance plans and a higher level of non-insured population at 21%).

**Figure 3** shows the national averages across the three programs for each of the three dimensions: pooled resources cover 51% of total direct costs for health, and out-of-pocket resources provide the remaining 49%; the three plans together cover a large portion of the Mexican population, leaving about 15% uncovered by health insurance; and, some (unidentified) services are not covered by any of the three main insurance plans.

But the cube diagram does not show how these three dimensions are distributed by the three plans, or what kinds of differences exist across the three plans. How would this Mexican Cube look disaggregated, and how could it be used to better guide policy taking into account equity? We prepared one possible representation, shown in **Figure 4**.

The Mexican Step Pyramid shows that, despite Mexico’s declaration of Universal Health Coverage in 2012, an estimated 15% of the population did not have health insurance coverage in 2011, according to FUNSALUD’s assessment of...
the national health system”9 (and the higher number from ENSANUT, the national survey of health and nutrition10). In addition, despite extensive nominal insurance coverage in Mexico, there remains a high level of out-of-pocket spending. Thus the costs of services actually covered is somewhat shallow—and especially so for those in Seguro Popular. The coverage of services for the Seguro Popular group is also less than the (nominal) 100% coverage in IMSS and ISSSTE. The available data do not allow us to fully understand where and how all of the un-pooled spending is taking place, so we cannot distinguish different levels of pooled resources being used for different service segments. We do know that, as in many low- and middle-income countries, the poorer Seguro Popular group spends a higher proportion of their income out of pocket than the non-SP groups.11

USING THE STEP PYRAMID

Constructing a Step Pyramid for a specific country allows national policy makers to visually display which income groups are covered by pooled funds, to what degree and for different health services. Regardless of whether the population has been sorted by income or coverage groups, the diagram can then be used to ask key priority-setting questions, most especially which population group or services should the government try to expand first, and to what degree? In Mexico, for example, the Step Pyramid shows various options for expansion: using existing programs to reach the 15% uncovered population; adding more services covered to the population receiving Seguro Popular; covering more costs through pooled resources; or encouraging beneficiaries to use the existing pooled resources rather than the private sector. The disaggregated cube makes these options more visible and the possible solutions easier to envision.

Once coverage expansion priorities are set, policy makers need to examine national budgets to match the “wish list” for expanded coverage and the related additional expenditures against available financial resources. Making this comparison is likely to lead to iterative adjustments (that are characteristic of budget-setting). That is, where do we have to do less than we would like? And where can we get more funding in order to produce a consistent plan? In addition to the need for higher taxes or increased donor funding, a Step Pyramid could also call attention to the possibility of moving resources from higher-coverage (and higher-income) blocks to make up the volume to be added for those who currently have lower levels of coverage.

Two common features of both the Cube and the Step Pyramid deserve emphasis. First, both figures are intended to show coverage under any pooled fund, either through insurance plans or through government-funded direct public provision of health services (such as the UK’s National Health Service). Second, both figures are intended to represent the actual coverage of services and costs, not what is nominally covered. Often the nominal and actual differ significantly as limitations in availability or quality of public services can drive patients to use private sector providers.

It is important to recognize the limits of both the Cube and the Step Pyramid when it comes to priority setting. As we have argued elsewhere, the goal of a nation’s health system should be to improve the life experience and well-being of its citizens.12 Three key metrics for measuring life experience are: health status, financial protection, and citizen satisfaction. Neither the Cube nor the Step Pyramid shows how the proposed changes in coverage affect these ultimate outcomes. As a result, policy makers will have to evaluate separately the desirability of different expansion options, by conducting an additional analysis of what alternative policy options would ‘buy’ in terms of better outcomes for specific population groups. We admit that this additional analysis is not always easy.

The additional analysis is complicated because the performance of a nation’s health system greatly influences the outcomes that different coverage levels produce. For example, poorly functioning health centers and hospitals will produce less health gain for a given level of funding than a well-managed delivery system, which operates at a higher level of efficiency. This leads us to strongly endorse the conclusion that health system strengthening (resulting in improved delivery capacity) has to occur hand-in-hand with coverage expansion.13 This interdependence is underlined when considering the potentially important role that efficiency gains could contribute as a potential funding source for expanded coverage.1

In short, improving health system performance is essential for coverage expansions to produce better health outcomes and financial risk protection. Attention to the supply side of health systems is required to assure the effectiveness and availability of services that become newly covered as a country moves toward UHC. In addition, attention to the demand side is required to assure that available services are actually used appropriately by the population. The importance of health system performance is illustrated by the contrast between the delivery difficulties encountered in Ghana’s health insurance system,14 where the government did not adequately expand the supply of health services after the country’s introduction of national health insurance, and the striking improvements in both access and outcomes produced by Turkey’s health reform, where the government developed both health facilities and workforce to assure the delivery of primary care services for newly insured populations.15,16 Without attention to the supply side, moving
toward UHC will result in nominal Universal Health Coverage instead of effective Universal Health Coverage. And nominal coverage will not produce significant improvements in citizens’ lives that ultimately are (or should be) the primary purpose of moving toward Universal Health Coverage.

Finally it is important to acknowledge that both the Step Pyramid and the Cube are, at best, ways of representing key questions confronting a nation as it moves toward UHC. How nations answer those questions inevitably has political dimensions. One classic definition of politics is that it encompasses the public processes that determine who gets what, when, and how. Decisions about changes in health coverage, especially those intended to benefit the poor, are fundamentally about changing the allocation of resources in society—and therefore quintessentially about politics. This recognition underlines the importance of political commitment and political skill on the part of national leaders in order to make real progress in moving toward greater equity in health systems as countries move toward UHC.

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

No potential conflicts of interest were disclosed.

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