



How Far Are We From Ensuring Opportunities for All? The Human Opportunity Index

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Universal access to key goods and services such as clean water, basic education, health services, minimum nutrition and citizenship rights is a crucial step towards justice and fairness. Expanding access to these goods and services has long been a central issue in the analysis of economic development and in public policy discussions, including the Millennium Development Goals initiative. The chance people have to pursue the life of their choosing involves the opportunity to access key goods and services, which constitute human capital investments that expand each individual's abilities and options. The goal of providing universal access to key goods and services is often included in national development plans, national constitutions, and international agreements such as the Universal Declaration of Human Rights. This chapter presents a method to measure a society's progress as it moves toward attaining universal access.

At first glance, one might think that simply measuring coverage rates suffices. But this has a fundamental shortcoming. As a country develops, the opportunity to access key goods and services is only partial; they are scarce and can be allocated in many different ways. The allocation of goods and services within the population is

never random, and in many cases is not egalitarian. An equitable development process should seek to ensure that the opportunity for children to access these key goods and services is not correlated with circumstances that are beyond their control, such as gender, parental background or ethnicity. The Human Opportunity Index (HOI), first presented by Barros et al. (2009), combines both coverage rates and equity in a single measure. The HOI considers a) how far a country is from the goal of providing universal access to a set of goods and services to all, and b) the degree to which each child in the country has an equal opportunity to access those good and services.

Equality of opportunity requires that access to key goods and services not be related to variables we call circumstances. Circumstances are personal, family or community characteristics that a child has no control over, and that, for ethical reasons, society wants to be completely unrelated to a child's access to basic opportunities. For instance, most societies would agree that opportunities should not be assigned based on gender, ethnicity, nationality, parental background or religion. Instead, opportunities should be allocated non-systematically and not be detrimental

to any particular social group. The HOI measures the coverage rate, and then adjusts it according to how equitably goods and services have been allocated among circumstance groups.

This chapter discusses what characterizes basic goods and services, and the implications of allocating them equitably. We also present the conceptual underpinnings of the HOI. It is a synthetic measure of how far a society is from universal access to a good or service, and how equitably access is distributed across circumstance groups. We briefly outline the HOI's properties, and present decompositions illustrating how progress can be made by expanding average coverage and/or more equitably distributing opportunities of access. Lastly, we outline a methodology to operationalize these concepts in 19 Latin American and Caribbean countries to assess progress during the last decade in universalizing basic opportunities for children. The empirical results are presented in the following chapter.

1.1. Key Concepts: Basic Goods and Services, Universality, Equality of Opportunity and Circumstances

Having opportunities means that people can pursue the life of their choosing. A critical aspect of this is having access to key goods and services that are fundamentally important for a person to lead a dignified life in modern society. Access gives a person the opportunity to

advance, although they may or may not ultimately achieve this advancement. In some cases, having access to one specific good or service is not enough. For example, the opportunity to learn requires a bundle of goods and services—access to a good school might not be enough; a child also needs adequate nutrition to have the opportunity to learn.

The HOI focuses on goods and services that constitute investments by people in themselves—those that improve a person's ability to expand her future production possibility frontier. These investments have a major impact on what a person can be or do, affecting both market and non-market outcomes. In this broad sense, investing in these goods and services increases one's human capital.

Our attention is limited to private goods and services that expand people's chances of living a better life. They are private in the traditional economic sense of being excludable. As long as the provision of these goods and services entails a cost and there are finite resources (i.e., a budget constraint), allocative decisions are required. Given the paramount importance of allocative decisions to economic and social policy, this study focuses precisely on access to goods or services that expand chances, and not on other dimensions of policy that might also play that role.¹

Basic goods and services and universality

Societies may decide that the universal access to selected goods and services should be a major social goal. Goals of this sort are often elucidated in national development plans and sometimes national constitutions, and are also laid out in the Universal Declaration of Human Rights. Whenever a national consensus exists that some goods and services should be enjoyed by everyone, we refer to them as basic. Even though the set of basic goods and services may vary with the socioeconomic and cultural context, the top priorities seem to be quite similar among all societies. To be considered basic, goods and services also need to be affordable—otherwise universal access would not be economically feasible.

A societal goal of universal access does not necessarily imply either how universality is to be accomplished or who is responsible. Even if universal access to a basic good or service is defined as a social right, it does not automatically mean that the public sector is responsible for provision or financing. In the extreme, a society may set a goal of universal access even when the responsibility is entirely individual,

not collective. For instance, to set a goal of universal access to adequate nutrition does not necessarily imply that everyone is entitled to receive a monthly food basket from the government. Societies may use multiple mechanisms in order to achieve universality. Universal access to primary education may be ensured through a system of free public schools, through a privately-managed but publicly-funded system, through a public school system that recovers costs from wealthier families only, or through private schools with partial or full scholarships depending on family resources.

Assessing progress towards opportunity for all: limitation of the coverage rate as a measure

If universal access to basic goods and services is to be considered a major development goal, then it is critical to develop adequate measures of the progress towards its accomplishment. Traditionally, the coverage rate—the proportion of the population with access to a given opportunity—has been used to measure progress. It certainly seems natural to measure progress by the distance of the coverage rate to its ideal 100 percent. However, measures of

¹ It should be noted that increasing opportunities sometimes does not require access to goods and services. For instance, to the extent that international migration represents a chance for progress, the right to migrate may be an opportunity in itself. Migration may have private costs, but if they are substantially outweighed by the benefits, it will be the lack of rights that will deter migration and consequent advancement. Many civil rights represent chances to progress and hence opportunities, without necessarily being associated with the access to any key goods or services. We do not dwell here on these types of opportunities.

progress should be sensitive to allocation. When there are sufficient resources to provide something to everybody, there will be no allocation dilemma. However, when available resources only allow for providing key goods and services to some, the decision of who enjoys access depends on allocation. In this situation, measures of progress towards the ideal of opportunity for all should privilege egalitarian allocation.

Consider, for instance, two societies (I and II) made of two ethnic groups (A and B) of equal population size. Suppose that at the current time, there are enough resources to give access to a specific service only to half of the population. Hence, in both societies the average coverage rate is 50 percent. Suppose, however, that in Society I the service is allocated to the ethnic group A and none to group B—the coverage rates are 100 percent for group A and 0 percent for group B. On the other hand, in Society II both ethnic groups equally share the limited available services, and as a consequence the coverage rate is 50 percent in both groups. Hence, even though both societies have the same average coverage rate, they differ remarkably in the allocation of their scarce services. In principle, the allocation rules of Society II are more egalitarian. As a consequence, any valid measure ought to indicate that Society II is closer than Society I to the ideal of equitably allocating goods and services, even if the total coverage rate in both

is only 50 percent. A single aggregated coverage rate is not enough to track progress toward the ideal of opportunity to all since it is insensitive to the fairness of allocation.

Equality of opportunity, circumstances and incidence analysis

This report, in the tradition of the World Development Report 2006 “Equity and Development” and of Barros et al (2009), adopts a notion of fairness that is related to equality of opportunities. To the extent that basic goods and service are scarce and indivisible, some people will have access to them and others will not. According to the principle of equality of opportunity, everybody should have the same chance of accessing them, regardless of their circumstances. In the example of two societies presented above, incidence analysis—which breaks down coverage by different socioeconomic and demographic groups—uncover differences in coverage rates for each ethnic group. For equality of opportunity to prevail, all group-specific coverage rates must be the same.

Circumstances, as used here, are personal, family or community characteristics over which an individual has no direct control. For ethical reasons, society wants these to be completely unrelated (directly or indirectly) to one’s access to basic opportunities. Boys and girls should all have the same opportunities to access good quality education and adequate

nutrition, irrespective of the education of their parents, their ethnicity or their place of birth. That is, when basic opportunities are limited, they should be allocated non-systematically and in a way not detrimental to any particular group.

The ethical ideal of equal opportunity is intimately related to equal treatment, lack of discrimination, citizenship and personal development independent of socioeconomic origin. What exactly determines which characteristics are considered a circumstance is more complex. One either provides an exhaustive list of all circumstances, or a general rule for identifying whether a characteristic is a circumstance or not. Any set of circumstances as used here is subjective or at least relative. Ultimately, each society chooses their own set of circumstances that it believes should not interfere with access to basic goods and services.

In some cases, circumstances may have a role as policy instruments in the provision of goods and services, because they are an efficient mechanism for expanding access. For example, despite the fact that a child should have access to basic nutrition regardless of their parent's income, social policy analysis might consider family income a valid instrument

for children to obtain access to basic nutrition support programs. Thus, even though society ideally prefers that family income not be related to children's access to basic food, it may use income transfers as an instrument to reduce malnutrition on a transitional basis. Similarly, in the long run societies want all children to have access to adequate nutrition and health care independent of their mothers' education. However, since a mother's education has a critical role in providing more opportunities to get adequate nutrition and health care, social policies are in many cases designed to strengthen this externality.²

Incidence analysis is an improvement over a single aggregated coverage rate for measuring progress towards leveling the playing field, since it can be sensitive to inequality of opportunity. Incidence analysis substitutes one coverage rate with many—one for each circumstance group. In the spirit of incidence analysis, one could say that for equality of opportunity to prevail, all group-specific coverage rates must be the same. Incidence analysis, however, is not enough to measure progress towards opportunity for all, since it does not provide a synthetic scalar measure of how far a society is from both equality of opportunity and universal coverage. To

² Can changing the distribution of circumstances be a valid policy? In the case of circumstances like gender, religion, ethnicity or nationality, society has no interest in changing their distribution to reach universal coverage. But society may, for example want to eliminate the influence of parental income on a child's education, to reduce the intergenerational transmission of poverty. One strategy to do that is through educational policies. But another could be to implement policies to reduce income inequality. A problem of this strategy is that equalizing opportunities through reducing inequalities in the distribution of circumstances is often impractical or might take too long.

track hundreds of coverage rates would be too cumbersome to be useful to both policymakers and other key stakeholders in society.³

The scalar measure of equal opportunity progress towards universal access to access basic goods and services, first presented in Barros et al (2009), takes into consideration both (a) average coverage and (b) if available goods or services are allocated equitably. A scalar measure of progress towards universality that combines these two features can be called an equality of opportunity-sensitive coverage rate.

Access, utilization, quality and outcomes

When measuring the access to specific goods and services, one must be very careful in defining what access means. Does access to schooling mean having a school nearby? Or having a good school nearby? Or attending school? Or having all the conditions needed to have a productive educational experience? Or achieving learning outcomes? One could easily imagine a situation in which a school or a health clinic exists in a community, but few actually take advantage of it. To the extent that opportunity is just the chance of accessing key goods and services for

children, there is a strong argument for universal coverage and defining equality of opportunity in terms of access and use. For this study, we assume that as long as the focus of analysis is children, then access and utilization should be considered the same. A child may have access to a school reasonably close to her home, but may not attend school because her parents do not value education or because the school is of very low quality. In this case, we treat the child as having no access to school. If this is a basic service, society must ensure that the child uses the service, which might entail not only having a school nearby, but also maintaining schools at a level of quality sufficient to convince parents that it pays to send their children to school, educating parents on the benefits (economic and otherwise) of education, or enforcing attendance. Hence, we consider that coverage should be measured as a student enrolling and attending a formal school. Another consideration is quality. Basic goods and service are usually not homogeneous, and quality might vary tremendously. If, for example, clean water is a basic good or service, it is important to empirically assess what modes of provision provide a minimum threshold of quality.

An alternative view considers coverage

³ When consider even a small number of circumstances, the number of relevant circumstance groups in a particular society can be very large. For example, consider the case of a society with only six relevant circumstances: gender (male-female), race (white-black), location (urban-rural), parental education (less than primary-primary-secondary-tertiary), and per-capita family income (classified in quintiles). In this particular case, with only six circumstances and a very parsimonious breakdown of each, we will have 160 circumstance groups.

to extend only to those who benefit from the use and access of a basic good and service above a minimum threshold. It is effective access to services of quality that produce a minimum level of outcome. For instance, the best practical measure of effective access to quality education could be the proportion of children of a given age with learning proficiency above a minimum level. In this view, access is just a means to reach minimum levels of certain outcomes that ought to be compulsory.⁴ It would not be sufficient to ensure universal access to schools of quality and to guarantee that all families have the conditions they need to fully take advantage of this opportunity. We do not pursue this alternative view due to the lack of comparable outcome indicators for all countries, as discussed below.

1.2. Constructing a Measure of Progress Towards Basic Opportunities for All

In this section we introduce and evaluate the properties of the Human Opportunity Index (HOI), a synthetic scalar measure for monitoring both

(a) the average coverage of a good or service, and (b) if it is allocated according to an equality of opportunity principle.⁵ Such scalar measures are fundamental for measuring progress towards the universal provision of basic goods and services. Such a summary measure could also be essential for improving targeting of neglected groups and for improving the effectiveness of a social policy aimed at universal access to basic goods and services.

The literature provides many measures of equality of opportunity, such as those presented in Bourguignon et al. (2007), Checchi and Peragine (2005), Barros et al (2008), Lefranc et al (2006), among others. The main contribution of this study is not only measuring equality of opportunity, but also how to incorporate equality of opportunity concerns when evaluating coverage. As such, the HOI assesses the whole empirical distribution of the provision of opportunities to access a specific good or service. It encompasses both the average coverage rate of a basic good or service and a relative measure of equality of opportunity.

⁴ According to this line of reasoning, universal access to opportunities is just an instrument to ensure minimum outcomes for all. What should be evaluated is not the universal access in itself, but its consequence on ensuring minimum merit outcomes. Accordingly, whenever available the best option would be a direct measure of these outcomes (percentage of infants surviving, or the percentage of eight year-olds who are literate). Measures based on outcomes are to a large extent at odds with the notion of opportunity as just a chance to progress. In principle, equality of opportunity should not necessarily lead to equality of outcomes or even to a minimum basic outcome for all. However, some of these outcomes, like a minimum learning threshold, may be considered opportunities, as they proxy access to a minimum bundle of goods and services, that, according to current technology, can produce a minimum learning standard.

⁵ Strictly speaking, this implies that we will calculate a measure that consists of the average coverage rate of a basic good or service (say, access to water). This will be adjusted by the degree by which access to this service (water) is allocated according to a principle of equality of opportunity. So, in this second step we are concerned with the equality of opportunity of having access to water.

Constructing the Human Opportunity Index

Any equality of opportunity-sensitive coverage rate must take into account both the overall coverage and the differential coverage rates of the several circumstance groups that make the whole population. The construction of an equality-sensitive coverage rate amounts to aggregating circumstance-specific rates in a scalar measure that, at the same time, increases with overall coverage and decreases with the differences in coverage among circumstance groups. One could imagine a number of alternative ways of constructing an equality of opportunity-sensitive coverage rate having these two properties. The HOI is based on

discounting a penalty for inequality of opportunity, P , from the overall coverage rate, C , so that

$$\text{HOI} = C - P$$

The penalty is chosen such that it is zero if all circumstance group-specific coverage rates are equal and is positive and increasing as differences in coverage among circumstance groups increase. This penalty makes the HOI sensitive to equality as well as overall coverage. Intuitively, P is larger the larger the dispersion of group-specific coverage rates. Only when the penalty is zero and average coverage is universal does the HOI reach the maximum value of one (see Box 1 for computation details).

Box 1: Computing the Penalty for Inequality of Opportunity

Computing P requires identifying all circumstance groups with coverage rates below the average rate; we refer to them as the opportunity-vulnerable groups. For each opportunity-vulnerable group, k , \bar{M}_k is the number of people with access to a good or service needed for its coverage rate to equal the average rate, while M_k is the number of people in group k with access. $M_k - \bar{M}_k$ is then the opportunity gap for the vulnerable group k . The penalty is the sum of the opportunity gaps of all vulnerable groups (called the overall opportunity gap) divided by the total population (N):

$$P = \frac{1}{N} \sum_{k=1}^v (M_k - \bar{M}_k)$$

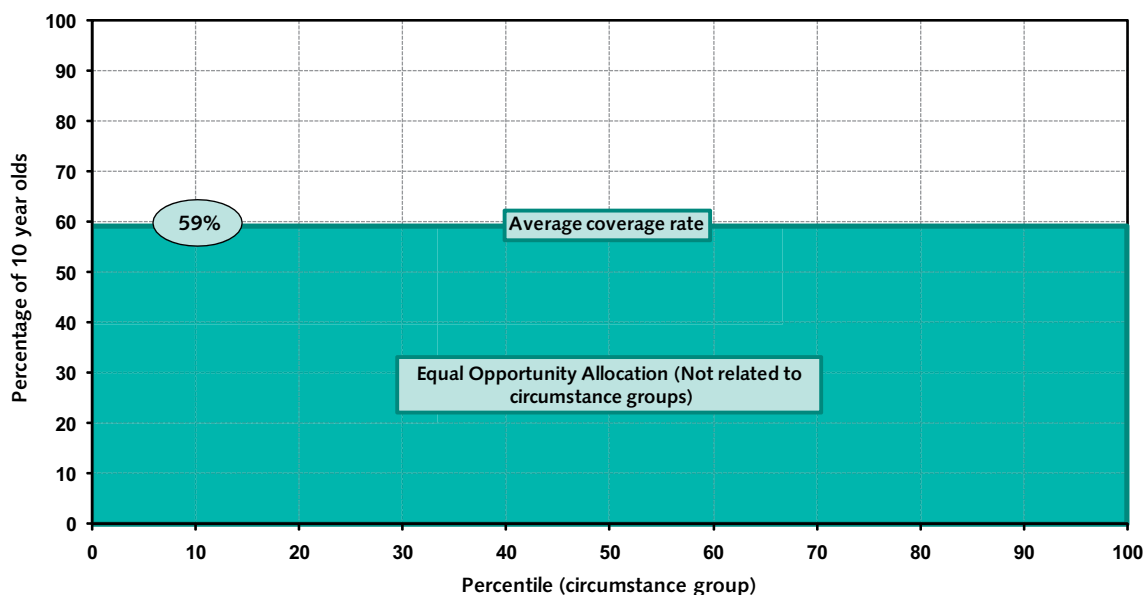
Intuitively, P can be interpreted as the percentage of people whose access would have to be reassigned to people of the groups with below-average coverage rates to achieve equality of opportunity. If all groups had exactly the same coverage rate, that penalty would be zero, and no reassignment would be needed. As coverage approaches universality for all groups, that reassignment becomes smaller.

Below we present a graphical explanation of the computation and interpretation of the HOI. The explanation uses data on access to safe water for 10 year-old children in a fictitious country (a detailed numerical example can be found in Annex 1). In the first example, the overall average coverage rate is 59 percent, and each circumstance group

specific coverage rate is also 59 percent, meaning this is a situation of equality of opportunity (Figure 1.1). The average coverage rate line represents the equal opportunity line. Even though access is not related to circumstances, the playing field is not level since 41 percent of the children do not have access to safe water while 59 percent do.

Figure 1.1

**Percentage of 10 year olds with Access to Safe Water
- Equal Opportunity Allocation -**



Source: Simulations for a fictitious country.

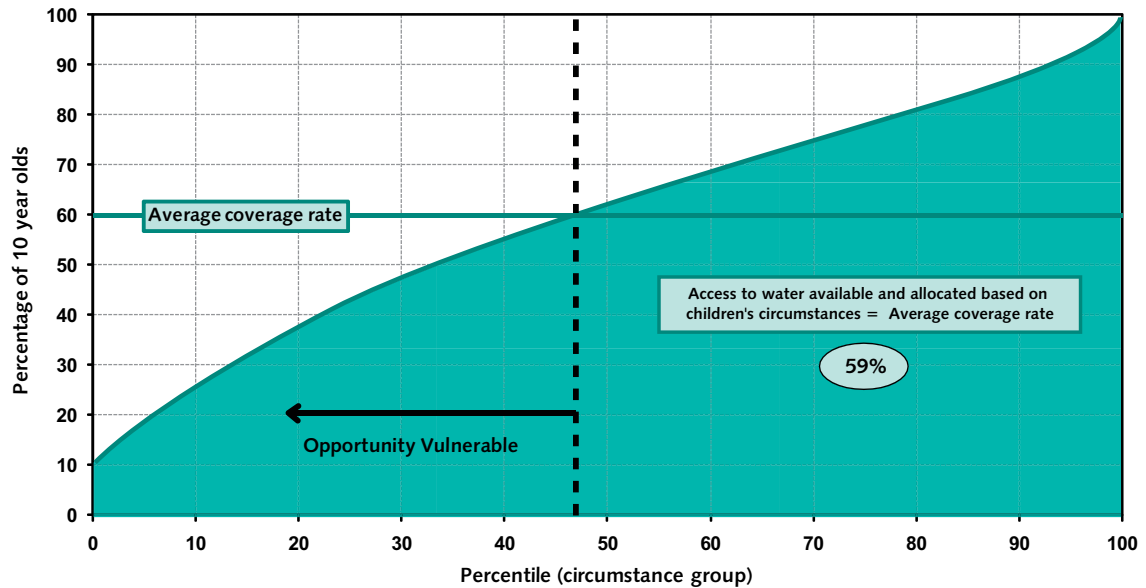
In the second situation, 59 percent of children still have access to safe water and 41 percent do not, but now the allocation is related to children's circumstances, and as such there is

no equality of opportunity (Figure 1.2).⁶ Those circumstance groups with coverage rates below the overall average rate are called "opportunity vulnerable" groups.

⁶ The horizontal axis depicts circumstance groups ordered according to the group-specific probability of access to water.

Figure 1.2

Percentage of 10 year olds with Access to Safe Water:
- Unequal Opportunity Allocation -



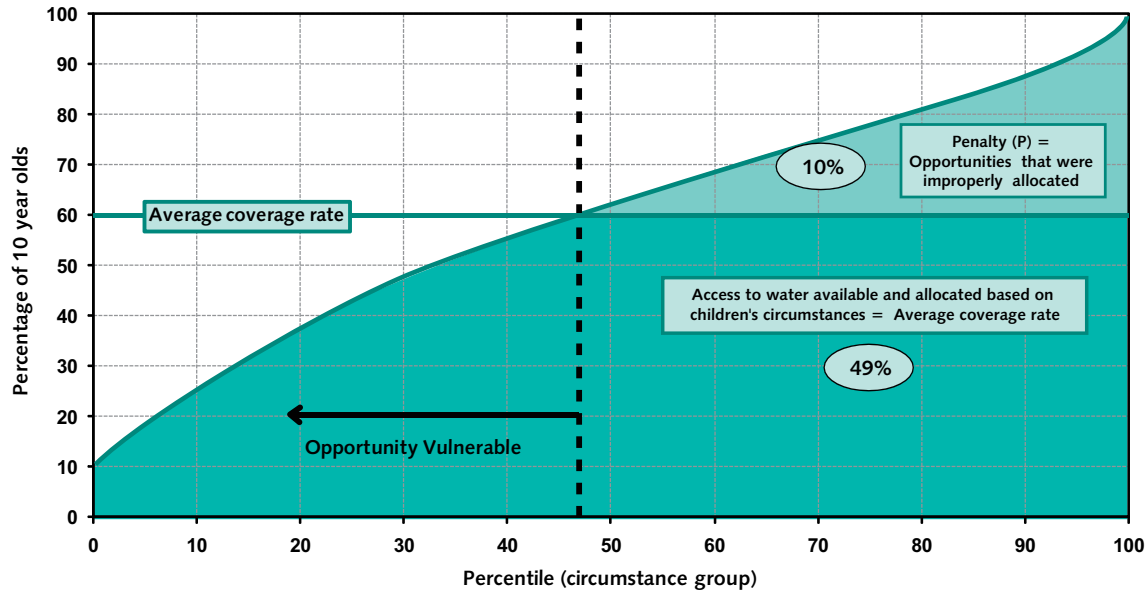
Source: Simulations for a fictitious country.

To calculate the HOI for the second situation, the penalty refers to access to safe water that was allocated in violation of the equal opportunity principle (Figure 1.3). Every allocation of access to water to circumstances groups above the overall average is a violation of the equality of opportunity principle, since access to safe water is not independent of circumstances. In this example, 10

percent of access to water was allocated inequitably. The HOI is equal to the average coverage rate (59 percent) minus the penalty for inequality of opportunity (10 percent): 49 percent. In other words, the HOI can be thought of as the weighted average of the circumstance group-specific coverage rates for all groups with below-average coverage.

Figure 1.3

Penalty for Inequality of Opportunity and the HOI Access to Safe Water



Source: Simulations for a fictitious country.

Properties

This section discusses three important properties of the HOI. First, it is defined as an equality-sensitive coverage rate. As such, its value falls as inequality in the allocation of a given fixed number of opportunities increases. In this case the opportunity gap may increase (it will never decrease), leading to a corresponding increase in the penalty. Second, this equality-sensitive measure is Pareto consistent. In principle, sensitivity to equality should never be so large that the index would decline when no one loses access but someone that previously had no access gains access. Even though

inequality may increase sharply, no coverage rate for any circumstance group would decline. Hence, there is no reason for the overall score to worsen. The HOI is indeed Pareto consistent. Whenever no one loses access and at least someone gains access, the index will always improve, regardless of whether that person belongs to an opportunity-vulnerable group or not.

Third, when the coverage rates of all circumstance groups increase proportionally, the HOI will increase by the same proportion. It can be easily established that in this case both the coverage and the penalty would also increase by the same percentage, as

would the index. In the case of an equal increase in percentage points for all group-specific coverage rates, the index would also increase by the same percentage points. In this case all differences in coverage rates and the penalty would remain unchanged, while the overall coverage—and hence the index—would increase by the same percentage points.

Thus, when (i) inequality declines and overall coverage remains constant, or (ii) overall coverage increases while inequality remains constant, the HOI will always improve. So it is in fact a valid inequality-sensitive coverage rate. Lastly, since the HOI is equal to the difference between the overall coverage rate and the penalty, it is always equal to or lower than the coverage rate. Since the coverage rate is lower than one (i.e., under 100 percent), so too is the index.

The HOI and the Dissimilarity Index

Using a penalty allows us to define an equality-sensitive coverage rate without actually measuring the level of inequality of opportunities. But a measure of relative inequality in the allocation of the opportunities, D , could be easily obtained by dividing the penalty, P , by the overall coverage rate, C . This measure might be constructed

as a “Dissimilarity Index” to measure dissimilar coverage rates across groups defined by circumstances. This index stands for the fraction of people who would need to have a good or service reassigned as a percentage of all people who have access to the good or service. Accordingly, $(1-D)$ would stand for the percentage of available opportunities that were properly allocated. It can be shown that

$$\mathbf{HOI} = \mathbf{C} - \mathbf{P} = \mathbf{C} * (1 - \mathbf{D})$$

Hence, the HOI can be seen as the average coverage rate, discounted by one minus the inequality index, D . An alternative interpretation of the Dissimilarity Index is that it is proportional to the difference between group-specific coverage rates and average coverage rates. The larger the difference, the larger is D . If all group-specific coverage rates are equal to the average, $D=0$, and the HOI is equal to the overall average coverage rate (C).

Decomposing changes in the HOI: composition and coverage effects

The HOI is determined by group-specific coverage rates and their corresponding population shares (the distribution of circumstances).⁷ As a result, the HOI

⁷ The overall coverage rate C is given by $C = \sum_k W_k C_k$ where W_k denotes the population share of circumstance-group k and C_k its specific coverage rate. It can be shown that, groups with specific coverage rates below (above) average are over (under) weighted relative to their population share. The HOI can be expressed as $HOI = (1 + \alpha) \cdot \sum_{k \in V} W_k C_k + \alpha \sum_{k \notin V} W_k C$ where $V = \{k: C_k < C\}$ denotes the set of all vulnerable circumstance-groups and, $\alpha = \sum_{k \notin V} W_k$ is the population share of non-vulnerable groups. The extent to which specific coverage rates are over- or under-weighted to obtain the HOI depends only on the share of the population in vulnerable groups (circumstance groups with specific coverage rates below average).

can only change when at least one of these two features changes. Hence, any change in the index can be traced either to changes in the distribution of circumstances (composition effect) or to changes in at least some group-specific coverage rates (coverage effect). The coverage effect can be further decomposed into changes due to changes in equality of opportunity (equalization effect) and changes due to average coverage rates (scale effect). Below we discuss the intuition behind each effect. A numerical example and a box with the algebra of the decompositions are found in Annexes 2 and 3.

The composition effect

Even though any change in the HOI can always be decomposed into composition and coverage effects, these two components do not have the same importance. The HOI measures progress towards the goal of opportunities for all. What matters is how far group-specific coverage rates are from the ideal of 100 percent. The distribution of circumstances is only used to weight the remaining gaps. If equality of opportunity prevails and all group-specific coverage rates are equal, changes in the distribution of circumstances will have no effect on the HOI. And once all group-specific coverage rates reach 100 percent, the goal will be reached irrespective of the distribution of circumstance.

Nevertheless, while inequality of

opportunity remains large, changes in the HOI could still come from changes in the distribution of circumstances, known as the composition effect. Most of the composition effect reflects structural demographic changes, overall economic development and increased investments in education. In certain cases, reducing the share in the population of certain groups could be, at least temporarily, an effective instrument to progress towards universal coverage. For instance, if malnutrition rates among children from income poor families are hard to reduce, an alternative policy could be to decrease the proportion of children in poor families through income transfers.

The coverage effect: scale and equalization

Progress in coverage can be achieved in two very distinct ways. One would be to increase all group-specific coverage rates proportionally. In this case, the degree of equality of opportunity would remain unchanged and the HOI would increase exclusively due to a change in the average coverage rate. We call this type of change a scale effect.

On the other hand, progress could be achieved by increasing coverage rates among vulnerable groups, compensated by a concomitant decrease in coverage rates among non-vulnerable groups that would hold the overall coverage rate unchanged. In this case, since the overall rate remains unchanged, the HOI

increases only due to the decline in the degree of inequality of opportunity. We call this type of change an equalization effect.

All changes in coverage can be expressed as a combination of a scale and an equalization effect. Hence, in principle the coverage effect can always be further decomposed into a scale and an equalization effect.

1.3. Empirical Considerations for Constructing the Human Opportunity Index

The HOI is constructed in three steps. First, we must select a specific basic good or service to focus on, and define minimum standards to fully characterize access. Second, we must choose a set of relevant circumstances. Third, based on microdata from household surveys we compute the coverage rate and the penalty for the specific basic good or service at hand.

Basic Goods and Services Considered and Minimum Standards

The HOI focuses on access to key goods and services by children 16 years of age and under. Independent of the intrinsic value of measuring access to key goods and services by children, focusing on this age range obviates the need to make any distinction between access and utilization related to effort, attitudes

or preferences of the child or parents. The assumption is that as long as society agrees on universalizing an opportunity, it must ensure utilization by children, independently of the preferences of the child or her family.

In principle, a set of the most basic goods and services for children is quite large, covering a wide range of what is needed for children to develop themselves and pursue a life of their choice. In order to make cross-country comparisons, we need comparable information on basic goods and services for all countries considered. The challenge stems from different survey terminologies and sometimes different national standards regarding adequate levels of service. For instance, access to safe water must have the same meaning and be measured similarly in all countries. To ensure comparability across countries and over time, a set of five indicators was chosen to represent the dimensions of education and housing (see Annex 4 for more details on the indicators).

a) **Education Dimension.** To capture the effective opportunity to quality education we use *completion of sixth grade at the proper age* (13 years old). Children completing sixth grade on time are more likely to have had access to schools of reasonable quality that ensure minimum learning and consequently can avoid unnecessary grade repetition. Some education systems in the region, however, adopt

automatic promotion while others do not, leading to potential inter-country comparability problems. To balance the potential comparability due to automatic promotions, we include *school attendance of children 10 to 14 years old* as an additional indicator.

b) **Housing Dimension.** To evaluate the opportunity to an enhanced quality of life we use the access to basic housing services: (i) *safe water*, (ii) *adequate sanitation*; and (iii) *electricity*.

(i) **Access to safe water and adequate sanitation.** Water and sanitation are primary drivers of public health. A vast literature finds a strong negative relationship between children's mortality rates and improved water sources and sanitation facilities (Abou-Ali Hala 2003; Galiani, Gertler, and Schargrotsky 2005; Fuentes, Pfütze, and Seck 2006; and Rutstein 2000; among others). Improved water and sanitation are linked to reduced incidence of diarrhea and related serious long-term consequences such as malnutrition and opportunistic infections (such as pneumonia), and physical or mental stunting. Moreover, WHO estimates that every year 1.4 million children under the age of five die from diarrheal diseases attributed to unsafe water

supply and inadequate sanitation and hygiene (WHO 2002).

(ii) **Access to electricity.** Electricity enhances the quality of life in a number of ways. First, it can promote a healthier lifestyle, for instance by improving air quality as electric stoves replace indoor biomass cook stoves. This is particularly helpful for young children and mothers. Replacing kerosene lamps with electricity has also been shown to reduce eye irritation, coughing, and nasal problems, and reduce the substantial number of children who die annually from accidental kerosene poisoning (Kaufman et al. 2000). But perhaps more importantly, there are other opportunities opened by access to electricity: improved conditions for studying in the evenings; accessing information and entertainment via radio, television, and the Internet; freeing parents' time from domestic chores so they could potentially spend that time raising their children; and home and community safety. Studies have documented that children spend more time studying after electricity is provided (Gustavsson 2007); electricity also allows access to modern educational techniques using computing, as in rural Peru (Bajak 2007).

To ensure inter-country comparability we opt to use the simplest possible concept for adequate access to water, sanitation and electricity. Most surveys in the region do not ask directly about potable (safe) water, but about the location and type of the water source and the system used for distribution. As a result, we consider as having access all households with water from the public network inside the dwelling. For sanitation, we consider as having access all households that have flush toilets inside the property that are connected to a waste removal system. For electricity, we consider access from any source adequate.

The basic goods and services used in this study all vary extensively in quality. It is clear that, for example, access to schooling hides a large variance in the quality of the service, while frequent blackouts, rationing and diminished wattage hinder the benefits a family can draw from access to electricity. Data access and comparability limitations make it difficult to gauge quality in basic goods and services. At this stage, for comparability purposes, the analysis is limited to indicators that measure quantity and not quality. Further analysis at the country level should incorporate the quality dimension, both because quality of services is a critical area of improvement in all countries, and also because there are large inequalities of quality of services across different groups of the population.

Choosing Circumstances

By circumstances we mean personal, family or community characteristics that a society believes should play no role in determining access to basic opportunities. For instance, most societies would agree that opportunities to access key goods and services should not be based on gender, ethnicity, nationality, parental background or religion. To the extent that equal opportunity requires independence from socioeconomic origin, parents' education and family income should also be treated as circumstances. Location of residence (urban vs. rural) may also be considered a circumstance, to the extent that a society believes that all children should have equal access to the same opportunities independently of where they live. This wide scope of circumstances represents a major challenge to any empirical work, due to data limitations.

Moreover, to assess the relative performance of different countries requires a set of empirically tractable circumstances and basic goods and services. Unfortunately, such a set—available for all countries—is limited. Instead, we must use information collected with reasonably similar methods across countries. For instance, if we wish to use family income as a circumstance, we must construct compatible income aggregates for all countries. However, some important circumstances, like ethnicity, have

distinct categories in different contexts, so they are trickier to use in regional studies. While in Brazil, Colombia and Panama the distinction between African and European descendents may be of major importance, in Guatemala and Bolivia the most important distinction maybe between indigenous people and European descendents. This type of variable is therefore difficult to use in a study that compares a set of countries. For this study, to ensure comparability across countries and also over time, a set of seven circumstances was chosen:

1. Parents' education (to capture socioeconomic origin)
2. Family per capita income (to capture availability of resources)
3. Number of siblings (to capture the dependency ratio)
4. The presence of both parents (to capture family structure)
5. Gender of the child (to capture one direct form of discrimination)
6. Gender of the household head (to capture one indirect form of discrimination)
7. Urban or rural location of

residence (to capture spatial disparities)

Computing the Human Opportunity Index for Access to a Basic Good or Service

Given a random sample of the population, with information on whether child i had access to a given basic good or service, and a vector of variables indicating her circumstances, we first use a regression model to estimate the empirical relationship between each circumstance and access to basic service. We then are able to predict the probability of access to a basic service for each individual with a given set of circumstances as well as the overall coverage rate. The next step is the core of the concept of inequality of opportunity, as we seek to derive an overall estimate of the extent of the variation in the coverage rates of individual children in the target population compared to the average coverage. The greater the variation, the higher the inequality of opportunity and the smaller the HOI (Box 2).

Box 2: The Six Steps to Build the Human Opportunity Index

1. Estimate a separable logistic model on whether child i had access to a given basic good or service as a function of his or her circumstances. For education, age was also used to predict the probability of completing each grade. The specification was chosen according to the needs of each circumstance: quadratic for years of education, logarithmic for real income, and categorical for age and the other dimensions. In all cases, the functions are linear in the parameters. From the estimation of this logistic regression, obtain coefficient estimates.

2. Given these coefficient estimates, obtain for each child in the sample the predicted probability of access to the basic good or service in consideration, \hat{p}_i based on the predicted relationship, $\hat{\beta}_k$, and a vector of their circumstances x_{ki} .

$$\hat{p}_i = \frac{\text{Exp}\left(\hat{\beta}_o + \sum_{k=1}^m x_{ki} \hat{\beta}_k\right)}{1 + \text{Exp}\left(\hat{\beta}_o + \sum_{k=1}^m x_{ki} \hat{\beta}_k\right)}$$

3. Compute the overall coverage rate C ,

$$C = \sum_1^n w_i \hat{p}_i$$

where $w_i = \frac{1}{n}$ or some sampling weights.

4. Compute the Dissimilarity Index D

$$\hat{D} = \frac{1}{2C} \sum_{i=1}^n w_i |\hat{p}_i - C|$$

5. Compute the penalty, $P = C * \hat{D}$

6. Compute the HOI = $C - P$

Constructing an Overall Human Opportunity Index

To generate a single measure of the distribution of opportunities for children, we need to construct an overall synthetic HOI comprising all basic goods and services under consideration. The overall HOI, in this study, is a simple average of the HOI of the two dimensions considered: education and housing. The HOI for education is a simple average of the HOI for completion of sixth grade on time and the HOI for school attendance for children 10-14. The HOI for housing

is a simple average of the HOI for access to water, the HOI for sanitation, and the HOI for electricity.⁸

The next chapter presents the empirical results for the HOI for the Latin America and Caribbean region. It tracks the changes children have faced in accessing opportunities to education and housing services in the region between 1995 and 2010 and decomposes the contributions of the composition and coverage effects, and presents a snapshot of how circumstances have affected inequality of opportunity for the region's children in the last fifteen years.

⁸ See Annex 5 for a brief discussion on alternatives for the aggregation sequence for building the overall HOI.