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A Human Opportunity Index for Children

An equitable development process should pursue the equalization of opportunities at all stages of an individual's life, seeking to level the playing field for all citizens. One component of inequality of opportunity is the unequal access of children to the "basic opportunities" needed to get a fair start in life. As long as all children in a country do not have access to education, health, nutrition, and basic services and access is correlated to circumstances for which the child is not accountable, such as gender, ethnicity, or family background, inequality of opportunity will prevail in that country. A goal of social and economic policy should be to reduce that correlation as much as possible and provide a level playing field to all children. Focusing on reducing inequality of opportunity is then a useful policy guidepost, and a critical first step is to have an adequate measure of this inequality.

This chapter seeks to measure inequality of opportunity by developing a Human Opportunity Index, a composite indicator that combines two elements: (i) the level of coverage of basic opportunities necessary for human development, such as primary education, water and sanitation, and electricity; and (ii) the degree to which the distribution of those opportunities is conditional on circumstances exogenous to children, such as gender, income, or household characteristics. This new index assesses the importance of both improving overall access to basic opportunities and ensuring its equitable allocation. By doing so, it can serve as a tool to help steer public policies with the aim of equalizing opportunity.

The Human Opportunity Index is calculated for a set of opportunities related to education (completion of sixth grade on time and school attendance for children ages 10–14) and housing conditions (access to clean water, adequate sanitation, and electricity), and then summarized in

a single overall index. Applied to discrete outcomes, it combines the two elements—coverage ($\overline{p}$) and inequality of opportunity (D)—in a single calculation in which coverage of a basic opportunity is adjusted by how unequally it is distributed.[1] The level of opportunity measured by this index can be interpreted as the number of existing opportunities in a given society that have been allocated based on an equal opportunity principle.

A critical step in estimating how existing basic opportunities are distributed is the development of a measure of inequality of opportunity, the D-index. It measures dissimilar access rates to a given basic opportunity for groups of children defined by circumstance characteristics (specifically, children's area of residence, gender, parents' level of education, per capita family income, number of siblings, and presence of two parents at home) compared with the average access rate to the same service for the population of children as a whole. The D-index ranges from 0 to 100, in percentage terms, and in a situation of perfect equality of opportunity, D will be zero. The D-index has an interesting interpretation as the fraction of all available opportunities that need to be reallocated from children of better-off groups to children of worse-off groups to restore equal opportunity.

The Human Opportunity Index uses data from 36 nationally representative household surveys for 19 Latin American and Caribbean countries over a period of approximately a decade (1995–2005). Together, the surveys represent nearly 200 million children ages 0–16 from the region. The results show remarkable improvement in opportunities in most countries in the region because of both improvement in coverage and more equitable allocation of opportunities. Still, countries have not improved uniformly in all basic opportunities and, in many cases, are far from providing universal access.

This chapter proceeds as follows. The next section discusses in more detail the motivation for choosing the selected basic opportunities and circumstance variables, as well as the data sources used for the estimations. The following section presents results on the first component of the Human Opportunity Index—the total coverage levels of each opportunity in the countries being studied. The methodology for the second component of the Human Opportunity Index, the distributional equality of basic opportunities for children—the D-index—and national estimates are presented in the third section. The fourth section provides the analytical framework for the Human Opportunity Index and reports empirical results for the 19 Latin American and Caribbean countries. The fifth section concludes by summarizing the findings.

Defining Basic Opportunities for Children

Basic opportunities are services that are critical for children's development. They are exogenous for the child, i.e., the child is a passive receiver, and

societies see universal provision as a valid social goal. Examples include access to primary education, early childhood education, immunizations, minimum nutritional levels, sanitation, clean water, electricity, and a birth certificate or other identity document. They are exogenous from the point of view of the child, because access is controlled not by her, but by her family or society. And universal provision of these basic opportunities is a valid and realistic social goal because they are affordable, given the available technology. And if they are not affordable today for a specific country, they might be in the near future through effective policies. Even if different societies might have various standards regarding the set of basic opportunities, in the case of children, most societies agree on a set of basic opportunities, at least at the level of intentions. This chapter focuses on inequality and coverage of basic opportunities among children for three main reasons:

- First, from an empirical standpoint, opportunities can be operationalized by measuring children's access to basic goods and services critical for the full development of a child. For children, access defines opportunity, because children (unlike adults) cannot be expected to make the efforts needed to access these basic goods by themselves.
- Second, from a policy standpoint, evidence indicates that early intervention in the life cycle of an individual to equalize opportunities is significantly more cost effective and successful than attempting interventions later in life.
- Third, focusing on children clarifies the message that socially determined inequality of opportunity is unfair and helps put opportunity equalization at the center of the policy debate. As pointed out by the *World Development Report 2006* (World Bank 2006), on the day of their birth, children cannot be held responsible for their family circumstances, despite the fact that these circumstances—such as race, gender, parents' income and education, and urban or rural location—will make major differences in the lives they lead.

Basic opportunities are those essential to ensuring that today's children will have the potential, as adults, to better achieve the outcomes of their choosing. A vast array of basic opportunities are relevant to policy and critical for children's future development. This chapter focuses on basic opportunities related to education and housing conditions. Aside from its intrinsic importance, data from household surveys to allow comparison across time and across a large number of countries are available for variables in these spheres.[2]

For education, the completion of sixth grade on time is used as a proxy for a child's opportunity for basic education. Primary schools must be of sufficient quality to provide the differentiated instruction required to get all children promoted through the first six years of schooling on time,

avoiding grade repetition or very low marks. If schooling quality is good, the child will learn the content needed to be promoted from grade to grade, regardless of his or her circumstances. In a world of equality of opportunity, all children, regardless of their circumstances, should have access to basic quality education. In practice, this variable is measured by computing the probability of having ended sixth grade on time for all children ages 12 to 16.[3] Some education systems, as in Jamaica, implement automatic promotion in primary education, while others do not, which may create comparability problems. This chapter also uses school attendance for those ages 10–14. This variable measures the gross attendance rate (that is, school attendance independent of grade) for children between the ages of 10 and 14. This measure thus includes children in late primary or early secondary education (depending on the country system).

A child's access to adequate housing conditions is a critical element of the opportunity for a healthy life. Three conditions have been selected for this study: access to water, to sanitation, and to electricity. Several studies have found a strong and negative relationship between children's mortality rates and improved water sources and sanitation facilities (see Abou-Ali Hala 2003; Galiani, Gertler, and Schargrodsky 2005; Fuentes, Pfütze, and Seck 2006; and Rutstein 2000; among others). Improved water, sanitation, and hygiene are the only ways to reduce the incidence of diarrhea and related serious long-term consequences, which include making children more vulnerable to malnutrition and opportunistic infections (such as pneumonia), and physical or mental stunting for the rest of their lives. The World Health Organization estimates that approximately 1.4 million children under age five die every year, mostly in developing countries, from diarrheal diseases attributed to unsafe water supply and inadequate sanitation and hygiene (WHO 2002, 1). Water and sanitation are primary drivers of public health, and should be considered basic opportunities for all children.

Access to electricity is also a basic opportunity for children. Electricity improves quality of life with respect to alternative sources of energy for lighting, cooking, and heating, such as kerosene and wood fuel. The provision of electricity to households allows for improved conditions for studying in the evenings; for avoiding deaths produced by indoor biomass cook stove pollution (particularly among young children and mothers); for accessing information and entertainment via radio, television, and the Internet; for freeing parents' time from domestic chores so they could potentially spend that time improving the process of raising their children; and for 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).[4] 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). Electricity also helps ease the domestic workload—women in rural areas can spend the equivalent of two working days per week in fuelwood collection (Budlender, Chobokoane, and Mpetsheni 2002).

For water, sanitation, and electricity, all children ages 0 to 16 are included in the sample. The indicator for each of these basic opportunities consists of the percentage of children ages 0 to 16 who live in a household with access to the utility. Each utility is considered separately and simple criteria are used for identifying from the surveys the access of a household to each opportunity. Most surveys in the region do not ask about potable (safe) water, but about the location of the water source and the system used for distribution. This variable takes the value of one if the household has access to water from the public network inside the dwelling or inside the property.[5] For recording access to sanitation, the variable is set equal to 1 when the house is connected to a public sewerage system or to a septic tank.[6] For electricity, the variable is equal to 1 if the household has access to electricity from any source.

Recorded access to a basic opportunity may hide substantial differences in the quality of the service. For instance, access to electricity does not guarantee complete 24-hour service or adequate wattage. Frequent blackouts and diminished wattage hinder the benefits a family can draw from access to electricity, with effects ranging from reliability of food conservation in refrigerators to hours of light for evening studying. Similar statements can be made with respect to completion of primary education on time and access to water and sanitation. Data access and comparability limitations make it difficult to gauge quality in basic opportunities. 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, because quality of services are 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.

A child's circumstances are defined by variables common to all surveys: (i) gender,[7] (ii) child's area of residence (urban or rural), (iii) the number of years of schooling of the family head, (iv) per capita family income, (v) either single-parent or two-parent household, and (vi) the number of siblings ages 0–16. These six circumstances are used for the analysis of access to education, water, sanitation, and electricity. Race and ethnicity would be extremely relevant in analyzing access to basic goods and services, as would more detailed location information (municipality, locality, or even neighborhood). However, these variables are not present in all nationally representative household surveys in the 19 LAC countries, and hence are not considered

The estimates in this chapter use data from 36 nationally representative household surveys for 19 LAC countries over a period of approximately

Table 2.1 Countries, Surveys, and Years

Country	*Survey*	*Survey years*	
Argentina	Encuesta de Impacto Social de la Crisis en Argentina		2002
Bolivia	Encuesta Continua de Hogares		2005
Brazil	Pesquisa Nacional por Amostra de Domicilios	1995	2005
Chile	Encuesta de Caracterización Socioeconómica Nacional	1996	2006
Colombia	Encuesta de Calidad de Vida	1997	2003
Costa Rica	Encuesta de Hogares de Propósitos Múltiples	1994	2004
Dominican Republic	Encuesta Nacional de Fuerza de Trabajo	1996	2006
Ecuador	Encuesta de Condiciones de Vida	1995	2006
El Salvador	Encuesta de Hogares de Propósitos Múltiples	1998	2005
Guatemala	Encuesta Nacional sobre Condiciones de Vida	2000	2006
Honduras	Encuesta Permanente de Hogares de Propósitos Múltiples	1997	2005
Jamaica	Jamaica Survey of Living Conditions	1996	2002
Mexico	Encuesta Nacional de Ingresos y Gastos de los Hogares	1996	2006
Nicaragua	Encuesta Nacional de Hogares sobre Medición de Nivel de Vida	1998	2005
Panama	Encuesta de Niveles de Vida	1997	2003
Paraguay	Encuesta Permanente de Hogares	1999	2005
Peru	Encuesta Nacional de Hogares	1998	2006
Uruguay	Encuesta Nacional de Hogares Ampliada		2006
Venezuela, R. B. de	Encuesta de Hogares Por Muestreo	1995	2005

Source: The World Bank and Universidad Nacional de la Plata (CEDLAS) Socio-Economic Database for Latin America and the Caribbean.

a decade (1995–2005; table 2.1). The goal was to choose two comparable surveys for each country as close as possible to 1995 and to 2005. Together, the surveys represent nearly 200 million children ages 0–16 from 19 LAC countries.[8]

Coverage of Basic Opportunities

This section addresses the first component of the Human Opportunity Index, coverage of basic opportunities. It provides detailed information on five basic opportunities in the 19 LAC countries under consideration,

without reference to the equity of their distribution, which is addressed in the following section.

For education, Latin America has registered, on average, an increase in both completing sixth grade on time and school attendance (table 2.2). By 2005, a simple average across countries of the probability of a 13-year-old child completing sixth grade was 68 percent, up from 57 percent in 1995, and 93 percent of children ages 10 to 14 were attending school, compared with 89 percent in 1995.[9]

The average probability of finishing sixth grade on time recorded impressive advances in several countries in the region, including Brazil, Colombia, El Salvador, Paraguay, and Peru, each of which expanded by 2 percentage points per year or more in a decade. These countries had very low initial levels of this indicator, and their efforts have put them closer to the leaders in the region. However, important differences persist across countries—in some, less than 60 percent of children finished sixth grade on time (Brazil, El Salvador, Guatemala, Honduras, and Nicaragua), compared with more than 80 percent in others (Argentina, Chile, Ecuador, Jamaica, Mexico, and Uruguay).

With regard to school attendance at ages 10 to 14, the expansion is less significant (only 0.4 percentage points growth per year over the decade), because the region had reached an already high level by the mid-1990s. However, dispersion across countries (that is, the difference between the lowest coverage and the highest coverage) has barely declined from 20 percentage points in 1995 to 18 percentage points in 2005, which suggests that no convergence is occurring and some countries still lag in this indicator.

The average growth in access to basic housing conditions was 0.8 percentage points per year in water, sanitation, and electricity (table 2.3). These small increases are not because the region has reached high levels of coverage. On the contrary, average coverage in sanitation is only 54 percent, in water 75 percent, and in electricity 84 percent. These averages hide important differences. For instance, in Costa Rica, 98 percent of children lived in dwellings with access to clean water, whereas only 55 percent dwell similarly in El Salvador. Only 21 percent of children ages 0 to 16 in Nicaragua lived in dwellings with sanitation in 2005, compared with 92 percent in Costa Rica. Access to electricity is the most uniform across the region, with several countries reaching universal access (Chile) or nearly universal (Argentina, Costa Rica, Mexico, and República Bolivariana de Venezuela), while those with the lowest rates have at least two-thirds of the population covered (Bolivia, Honduras, Nicaragua, and Peru).

These figures only register average access to the selected basic opportunities in each country. They do not indicate whether children of a certain gender, location, or family structure have different access rates. Different access probability rates for children of different circumstance backgrounds would mean that the average rates hide important inequality in

Table 2.2 Coverage of Basic Opportunities in Education

	Sixth grade on time			*School attendance (ages 10–14)*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	85	—	—	96	—
Bolivia	—	78	—	—	95	—
Brazil	24	47	2.3	90	97	0.7
Chile	78	83	0.5	98	99	0.1
Colombia	63	76	2.2	89	91	0.3
Costa Rica	64	72	0.8	89	94	0.5
Dominican Republic	54	66	1.2	96	97	0.1
Ecuador	69	81	1.1	84	89	0.4
El Salvador	37	51	2.0	85	90	0.7
Guatemala	25	33	1.5	79	81	0.3
Honduras	43	54	1.3	78	84	0.8
Jamaica	89	88	-0.2	96	95	-0.2
Mexico	75	88	1.3	89	95	0.6
Nicaragua	33	44	1.6	81	88	0.9
Panama	75	77	0.3	92	94	0.3
Paraguay	53	66	2.3	93	92	-0.1
Peru	61	79	2.2	94	96	0.2
Uruguay	—	81	—	—	97	—
Venezuela, R. B. de	69	78	0.9	94	96	0.2
Average	**57**	**68**	**1.3**	**89**	**93**	**0.4**

Source: Authors' compilation based on data sources in table 2.1.

Note: — = Not available.

access to these basic opportunities. These differences have to be identified and measured so that corrective courses of action can be adopted. The next section turns to this task.

Measuring Inequality of Basic Opportunities for Children

This section addresses the second component of the Human Opportunity Index: the distribution of existing basic opportunities in a country that has not achieved universality. Basic opportunities are exogenous for children, even though they are endogenous to society.[10] Access to safe water and basic education, for example, are clearly not under the control of the child. Because lack of effort cannot justify children's lack of access to basic

Table 2.3 Coverage of Basic Opportunities in Housing Conditions

	Water			*Sanitation*			*Electricity*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	93	—	—	82	—	—	99	—
Bolivia	—	64	—	—	32	—	—	68	—
Brazil	90	94	0.4	50	60	1.0	89	95	0.7
Chile	91	97	0.6	77	91	1.4	96	100	0.4
Colombia	80	82	0.3	62	64	0.2	91	93	0.3
Costa Rica	84	98	1.4	78	92	1.4	95	99	0.3
Dominican Republic	—	68	—	—	58	—	—	93	—
Ecuador	61	74	1.1	53	62	0.9	87	94	0.6
El Salvador	48	55	1.1	30	29	-0.2	75	84	1.2
Guatemala	62	70	1.3	22	34	2.0	66	75	1.4
Honduras	—	73	—	—	34	—	57	60	0.4
Jamaica	63	58	-0.9	47	46	-0.2	77	86	1.6
Mexico	80	89	0.9	41	55	1.3	94	99	0.5
Nicaragua	52	56	0.6	15	21	0.9	60	65	0.7
Panama	84	86	0.3	43	44	0.2	69	73	0.6
Paraguay	41	57	2.6	51	57	0.9	88	94	1.0
Peru	53	56	0.4	43	61	2.2	63	69	0.8
Uruguay	—	90	—	—	81	—	—	98	—
Venezuela, R. B. de	92	90	-0.2	83	86	0.4	99	99	0.0
Average	**70**	**75**	**0.7**	**50**	**54**	**0.9**	**80**	**84**	**0.7**

Source: Authors' compilation based on data sources in table 2.1.

Note: — = Not available.

goods and services, such access can be conceived of as the opportunities children are given. This makes indicators of opportunity empirically more tractable. The empirical analysis of inequality in those variables does not have to worry about disentagling the portion related to inequality in access to basic opportunities derived from circumstances from that related to any type of choice or effort.[11] For children, measurable inequality in access to basic goods and services related to circumstances such as gender and race *is* inequality in opportunity. On a completely level playing field, circumstances should play no role in the distribution of basic opportunities among children.

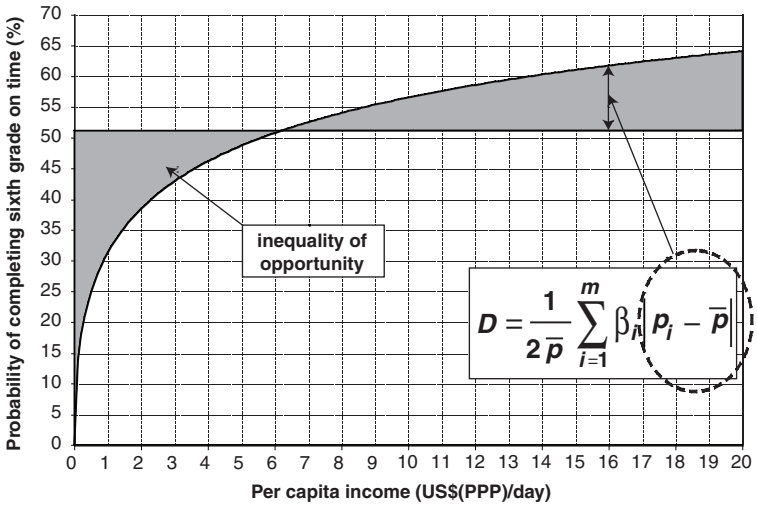
As discussed in chapter 1, the goal of equality of basic opportunities has two components: (i) ensuring that as many people as possible have access to basic opportunities, and (ii) ensuring that, in situations of limited available opportunities resulting from resource constraints, existing opportunities are fairly distributed, without any correlation with circumstances. The measure of inequality of opportunity constructed here (the *D*-index) estimates how fairly an existing set of limited (constrained) opportunities is distributed.

Building the D-Index

This measure of inequality of opportunity is a version of the dissimilarity index widely used in sociology and applied to dichotomous outcomes.[12] The *D*-index measures how dissimilar access rates are to a given service for groups defined by circumstance characteristics (for example, location, gender, parental education, and so forth) compared with the average access rate to the same service for the population as a whole. If the equal opportunity principle is consistently applied, an exact correspondence between population and opportunity distribution should be observed. That is, if half the population is in circumstance group A, 35 percent in group B, and 15 percent in group C, opportunities should be distributed in the same proportion. The *D*-index ranges from 0 to 1 (0 to 100 in percentage terms),[13] and in a situation of perfect equality of opportunity, *D* will be zero.

Access probability gaps are at the heart of the *D*-index (figure 2.1). The horizontal line located just above the 50 percent mark represents the average probability in the entire population that a child will complete sixth grade on time (the opportunity variable in this case), while the curved line represents the same outcome plotted by per capita income (the circumstance variable). The left-hand shaded portion represents poor income groups that have lower probabilities of finishing sixth grade than the population average, while the right-hand portion reflects wealthier children who have a higher-than-average probability of finishing on time. Access probability gaps are the absolute differences between group-specific access rates (p_i) and the overall average access rate ($\overline{p}$).

Figure 2.1 The *D*-Index: An Index to Measure Inequality of Opportunity



Source: Authors' estimation.

Note: PPP = purchasing power parity.

There can be as many probability gaps as possible combinations of group-defining circumstances. For example, 20 income groups, 7 family-size groups, and whether one is in a rural or urban setting together generate 280 probability gaps. If the years of schooling of parents, the presence of either one or two parents at home, and the gender of the child are added in, the total number of probability gaps would be a very large number. The *D*-index summarizes all those access probability gaps into a scalar measure by weighting them according to the population share in each circumstance group.[14]

In short, the *D*-index is a relative measure of the weighted average access probability gaps between different circumstance groups and the overall average access rate.[15] Thus, it can be interpreted as showing the fraction of all available opportunities that need to be reassigned from better-off groups to worse-off groups to achieve equal opportunity for all.[16]

National Estimates of Inequality of Opportunity among Children

Before moving on to combine the *D*-index estimates of unequal opportunity distribution with coverage levels to generate the Human Opportunity Index, we briefly review preliminary results on opportunity distribution alone. The *D*-index was applied to the 19 countries whose household surveys present nationally representative data, in most cases at two time

Box 2.1 Computing the *D*-Index Empirically

The *D*-index of inequality of opportunity could be estimated through a variety of parametric, nonparametric, or semi-parametric procedures. One could impose separability restrictions or consider interactions. In all cases, the three-step procedure described here would apply. Because this study applies this procedure to all Latin America and Caribbean countries with available data, and for several points in time, a standard specification that could be feasibly applied to all countries at all times is most desirable. This study's choice was a separable logistic model.

Given a random sample of the population, with information on whether child j had access to a given opportunity, and a vector of variables indicating his or her circumstances, one needs to follow three steps to estimate the *D*-index of inequality of opportunity:

1. Estimate a separable logistic model on whether child j had access to a given opportunity as a function of his or her circumstances. The circumstances considered include parents' education, family per capita income, gender, family structure (number of siblings, single-parent household) and area of residence (urban versus rural). For education, age was also a variable 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 one obtains coefficient estimates.
2. Given these coefficient estimates, obtain for each child in the sample the predicted probability of access to the opportunity in consideration, $\hat{p}_j$.
3. Compute
$$\bar{p} = \sum_{1}^{n} w_j \hat{p}_j \text{ and } \hat{D} = \frac{1}{2\bar{p}} \sum_{j=1}^{n} w_j \left| \hat{p}_j - \bar{p} \right|, \text{ where } w_j = \frac{1}{n}$$
or some other sampling weights.

Note: For a more complete discussion of the estimation procedures, see Barros, Molinas, and Saavedra (2008).

points, to analyze children's inequality of opportunity in education, electricity, and improved water and sanitation. The results are synthetic measures of the variation across circumstance groups of the way in which existing opportunities are distributed, depending on a child's born attributes and family background. In all cases, a lower score implies greater equity in the distribution of opportunity. The estimate can be interpreted as the share of opportunity that needs to be reallocated from more advantaged to less advantaged groups to achieve equality of opportunity.

Completing sixth grade on time is one of the indicators used to analyze inequality of educational opportunity. The average[17] for 2005 of the

D-index for the 19 countries considered is 11 percent, indicating that 11 percent of the opportunities of children to complete sixth grade on time need to be reallocated in these countries to eliminate the differences across the defined circumstance groups. This number is lower than the average for 1995 (17 percent), indicating that the region has improved markedly in equality of opportunity of finishing primary education on time.

The degree of inequality of opportunity of finishing sixth grade on time, however, varies considerably across countries in the region, ranging from 3 percent or less in Argentina, Chile, and Jamaica to more than 20 percent in Brazil, Guatemala, and Nicaragua.[18] Another way to phrase this is that in Chile, better-off groups and worse-off groups are on average only 3 percent above or below the national average of finishing sixth grade on time, whereas in Guatemala this average distance is 27 percent.

School attendance rates for children ages 10 to 14, another educational indicator, show very low levels of inequality of opportunity. All countries with the exception of Honduras show a *D*-index of 5 percent or less in 2005. That is, 5 percent or less of total available opportunities would have to be reallocated among circumstance groups of children to equalize across all groups the probability of attending school. Over the previous decade, the level of inequality of educational opportunity for children declined from an average of 4 percentage points to an average of 3 percentage points. This low level of inequality is associated with the high levels of coverage, sometimes universal, that have been reached in the region since the mid-1990s (table 2.4).

Inequality of opportunity averages 12 percent in water, 26 percent in sanitation, and 10 percent in electricity in 2005 in the region. Again, these averages hide important cross-country differences. Inequality in access to sanitation ranges from more than 40 percent in Bolivia and the Central American countries of El Salvador, Guatemala, and Nicaragua, to 10 percent or less in Argentina, Chile, Costa Rica, Uruguay, and República Bolivariana de Venezuela. These wide differences across countries—up to 45 percentage points in sanitation—are smaller in the case of water (27 percentage points) and even less in electricity (26 percentage points). Inequality in access to water ranges from less than 5 percent in Argentina, Brazil, Chile, Costa Rica, Mexico, Panama, Uruguay, and República Bolivariana de Venezuela to more than 20 percent in Bolivia, Nicaragua, Paraguay, and Peru. Inequality in access to electricity ranges from more than 24 percent in Nicaragua and Honduras to zero in countries with universal coverage, such as Chile.

Between 1995 and 2005, opportunity inequality declined 0.4 percentage points a year in water and electricity, and 0.7 percentage points in sanitation. The slow improvement in water and in sanitation, despite high initial levels of inequality, indicates that advances in promoting equality of opportunity in these areas have been slow. Dispersion is even more striking in these cases. Some countries have made remarkable efforts, such as Guatemala, Mexico, and Peru, which have reduced inequality of opportunity by 1 percentage point per year or more for sanitation. However,

Table 2.4 Inequality of Opportunities (*D*-Index) in Education

	Sixth grade on time			*School attendance (ages 10–14)*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Ammual change*
Argentina	—	3	—	—	1	—
Bolivia	—	7	—	—	2	—
Brazil	36	20	−1.6	3	1	−0.2
Chile	6	3	−0.3	1	0	0.0
Colombia	20	11	−1.5	4	3	−0.1
Costa Rica	12	9	−0.3	5	2	−0.3
Dominican Republic	16	12	−0.4	1	1	0.0
Ecuador	11	7	−0.4	7	5	−0.2
El Salvador	25	15	−1.4	4	4	−0.1
Guatemala	37	27	−1.6	5	5	0.0
Honduras	20	17	−0.5	10	7	−0.4
Jamaica	3	2	−0.1	1	1	0.0
Mexico	10	5	−0.5	4	2	−0.2
Nicaragua	30	24	−0.8	6	4	−0.4
Panama	11	8	−0.4	3	3	−0.1
Paraguay	15	11	−0.7	2	3	0.1
Peru	16	9	−0.9	2	2	0.0
Uruguay	—	7	—	—	2	—
Venezuela, R. B. de	11	6	−0.4	2	1	−0.1
Average	**17**	**11**	**−0.7**	**4**	**3**	**−0.1**

Source: Authors' calculations.

Note: — = Not available.

some countries have recorded an increase in inequality in opportunities for sanitation (Jamaica). Paraguay and El Salvador have reduced inequality of opportunity in access to water by 1.8 and 0.8 percentage points per year, respectively.

Links between Inequality of Opportunity and Coverage

The results for inequality of opportunity described above mirror the numbers for coverage. That is, electricity is the most prevalent basic opportunity in the region, and also the least unequally distributed, whereas sanitation is the most unequally distributed as well as the least widespread. Are these two elements (coverage and inequality) inevitably connected? The correlation is high, but not perfect. Countries with high coverage are bound to have low inequality in access—if everybody has access there can be no

group that is systematically without access. However, countries with low levels of coverage need not have high inequality. In fact, some countries have similar levels of average access but different levels of inequality. For instance, both El Salvador and Nicaragua have the same percentage of children with access to water (55 and 56 percent, respectively), but the former displays much less inequality than the latter (19 percent versus 28 percent). Going back to education, Peru and República Bolivariana de Venezuela have similar percentages of children finishing sixth grade on time (79 percent and 78 percent, respectively; table 2.2), but the former is more unequal than the latter (9 percent and 6 percent, respectively; table 2.4).

Nor do countries with higher levels of inequality produce higher reductions in it. For instance, Panama had an initial inequality index in sanitation of 35 percent while Mexico scored 33 percent (table 2.5). However, Mexico had a large reduction in inequality (1.2 percentage points a year) while Panama had a slower fall (0.6 percentage points). El Salvador and Nicaragua had similar levels of inequality in access to water (24 percent and 26 percent, respectively), but the former reduced its inequality at a rate of 0.8 points a year whereas the latter increased it at 0.3 percentage points.

Consequently, the data for the 19 countries, using the average prevalence ($\overline{p}$) and the *D*-index reveal three interesting patterns. First, countries with high average access rates also have very low *D*-indexes. Second, countries with lower average access rates have very high *D*-indexes. This need not necessarily be the case. One could imagine that a poor society concerned with equality and its available scarce basic goods would distribute them equally among different social groups. However, the pattern observed in Latin America and the Caribbean is that countries with low prevalence of an opportunity (generally poor countries) also have a very unequal distribution between circumstance groups. Third, despite the correlation between the indexes, in a few cases the rankings diverge, indicating that countries track their own paths with regard to equality of opportunity.

These examples indicate that changes in average access to a basic opportunity may be accompanied by different changes in inequality of access. Reducing inequality of access is not guaranteed for countries with low coverage, nor is it an immediate by-product of expansion in coverage. Hence, a simultaneous look at both average access and distribution of access is required, which is the role of the Human Opportunity Index.

The Human Opportunity Index

Most policy makers would prefer to have sufficient resources to provide basic opportunities to all children in society, no matter their background. This desire is seldom realistic, especially in developing countries with budget constraints. Policy makers are forced to make hard choices about how a limited set of opportunities is distributed in a society. The Human Opportunity

Table 2.5 Inequality of Opportunities (*D*-Index) in Housing Conditions

	Water			*Sanitation*			*Electricity*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	4	—	—	8	—	—	1	—
Bolivia	—	20	—	—	42	—	—	22	—
Brazil	6	3	−0.2	25	19	−0.6	8	3	−0.5
Chile	7	2	−0.5	14	5	−0.9	3	0	−0.3
Colombia	15	12	−0.4	26	25	−0.2	6	5	−0.2
Costa Rica	5	1	−0.4	11	4	−0.7	2	1	−0.1
Dominican Republic	—	12	—	—	21	—	—	3	—
Ecuador	12	10	−0.2	24	21	−0.3	7	4	−0.3
El Salvador	24	19	−0.8	47	44	−0.4	14	9	−0.7
Guatemala	12	10	−0.2	51	41	−1.7	14	11	−0.6
Honduras	—	10	—	—	37	—	26	26	0.0
Jamaica	18	19	0.2	22	23	0.1	5	3	−0.3
Mexico	10	4	−0.6	33	21	−1.2	4	1	−0.3
Nicaragua	26	28	0.3	50	49	−0.1	24	24	0.0
Panama	9	6	−0.4	35	31	−0.6	23	19	−0.6
Paraguay	31	20	−1.8	30	26	−0.8	6	3	−0.5
Peru	25	22	−0.4	34	20	−1.7	26	22	−0.6
Uruguay	—	6	—	—	10	—	—	1	—
Venezuela, R.B.	5	4	−0.1	7	5	−0.2	1	1	0.0
Average	**15**	**12**	**−0.4**	**29**	**26**	**−0.7**	**11**	**10**	**−0.3**

Source: Authors' computations.

Note: — = Not available.

Index helps estimate how equitably access to basic opportunities is distributed throughout the population of children in a country, that is, whether the distribution of opportunities is associated with circumstances.

Combining Coverage Rates and Distribution in a Single Indicator

For a policy maker in a country without sufficient resources to immediately provide all basic opportunities to the population, the question arises: should policy try to minimize inequality of opportunity in a situation of limited total opportunities, or should it seek to raise the average access rate, notwithstanding distribution? To answer this question and set the stage for proposing a formal Human Opportunity Index for children, an example can be useful.

Consider four cases in a hypothetical country with a population of a quarter million families; the country is currently facing the threat of a pandemic disease affecting children. All households in this country have four children. The country is bilingual and evenly split between those who speak blue and those who speak red.

Equal deprivation (case 1). One million vaccines are needed for one million children, but none are available. The average access rate ($\overline{p}$) is zero and the *D*-index is also zero.[19]

Full coverage (case 2). The government has a budget for one million vaccines and all children are vaccinated. The average access rate is one (100 percent) and the *D*-index is zero.

Biased partial coverage (case 3). The budget can pay for only half a million vaccines. The government, which is run by the red-speaking people's party, decides to inoculate red-speaking children only. In this case, the average access rate is 0.5 (50 percent) and the *D*-index is also 0.5.

Equal partial coverage (case 4). The government has the same limited budget for vaccines (half a million vaccines) but decides to inoculate only two children per family. Only half of the children are vaccinated, regardless of their language. In this case, access is 0.5 and the *D*-index is zero.

How is a policy maker to decide between these situations? Clearly, case 2 (full coverage) is the best of the four cases, and case 1 (no coverage) is the worst. From a certain perspective, case 3 (biased partial coverage) would seem superior to case 1, because at least some of the population is covered, and those who are not covered are no worse off either way (a Pareto improvement). However, for a policy maker concerned with equitable distribution within society, case 3 is clearly worse than case 4 (equitable partial coverage), because, although the access rate is the same, the *D*-index is higher for case 3. The objective for this policy maker is to maximize the average access rate, $\overline{p}$, and reduce inequality of opportunities, *D*.

Let us further analyze the meaning of the average access rate, $\overline{p}$. Let *H* be the total number of opportunities available and *N* be the number

of opportunities needed to ensure access for all. Then $\bar{p} = H/N$ can be reinterpreted as the percentage actually available of the total number of opportunities required for universal access. This interpretation of $\bar{p}$ clarifies both its strengths and its weaknesses. It demonstrates that $\bar{p}$ is certainly a measure of the stock of available opportunities, but it is completely insensitive to how these opportunities are allocated.

These observations provide clear direction for improving upon $\bar{p}$. A simple and intuitive improvement would be to modify the numerator so that only those opportunities allocated without any regard for circumstances are considered valid. Hence, if we let r denote the available opportunities allocated, respecting the principle of equal opportunity, then the desired function, O, can be expressed as $O = r/N$.

However, more specificity is required for r. One alternative is already available. Because the measure of inequality of opportunity, D, is the proportion of opportunities that must be reallocated for equality of opportunity to prevail, then $1 - D$ is the proportion properly allocated. Thus, $H(1-D)$ is the total number of opportunities allocated according to the principle of equal opportunity for all. Hence, one possibility is to let $r = H(1-D)$. In this case, the overall measure of opportunity, O, will be given by

$$O = \frac{r}{N} = \frac{H}{N}(1-D) = \bar{p}(1-D),$$

where $O \leq \bar{p} \leq 1$ and $O \leq D \leq 1$.

The level of opportunity measured by this index can be interpreted as the number of existing opportunities in a given society that have been allocated based on an equal opportunity principle. It is measured as a proportion of the total opportunities necessary for universal access. Those existing opportunities allocated in favor of specific circumstance groups, contrary to the mandate of the equal opportunity principle, are not counted in the level of opportunity of this society. Hence, another interpretation of the Human Opportunity Index is as the equal-opportunity-equivalent coverage of basic goods and services.

The Human Opportunity Index combines the two elements—coverage and inequality—in a single calculation. This function, inspired by Sen (1976), can provide a complete ordering of the four situations presented above. The equal deprivation situation (O = 0) is worse than the biased partial coverage situation (O = 0.25), which is worse than the equal partial coverage situation (O = 0.5), which is worse than the full coverage situation (O = 1). The two opposing forces that drive the Human Opportunity Index can be seen at work in the four cases. On the one hand, for a given level of the D-index, an increase in overall access to opportunities (a higher $\bar{p}$) raises the Human Opportunity Index, no matter how it is distributed. On the other hand, for a given level of access, lower equality of opportunity (a higher D-index) lowers the Human Opportunity Index. Going from equal partial coverage (case 4) to biased partial coverage

(case 3) reduces the Human Opportunity Index from 50 percent to 25 percent. In this case, the egalitarian criterion kicks in: equally distributed opportunities keep the index at 50 percent, but if the government does not intervene to ensure equal distribution, the Human Opportunity Index falls to 25 percent.

The Human Opportunity Index is sensitive to allocations of opportunities to disadvantaged circumstance groups with respect to advantaged ones, but it is insensitive to the size of the population (if both coverage and inequality are kept constant). In addition, despite its distributive sensitivity, the index is Pareto-consistent: an increase in the number of opportunities available to any group will always increase the index. Its distributive sensitivity, however, implies that the impact will be greater if the increase benefits groups with below-average access to opportunities. [20]

Empirical Results from 19 LAC Countries

This section presents national estimates of the Human Opportunity Index, which expresses the interaction between total prevalence of opportunities and how they are distributed in two dimensions: education and housing conditions. Computations of the Human Opportunity Index are made for each country for each of the indicators within these dimensions (tables 2.6 and 2.7). For instance, with respect to finishing sixth grade on time, only 24 percent of all opportunities needed to ensure universal access to primary education are both available and allocated equitably in Guatemala, compared with 86 percent in Jamaica. This is the combination of both average coverage and distribution of access. In Guatemala in 2005, 33 percent of children had completed primary education on time ($\bar{p}$ = 0.33; see table 2.2), or only 33 percent of the opportunities needed for universal coverage were available. Out of these, 27 percent (or 9 percentage points) were not allocated equitably (see table 2.4). As a consequence, only 24 percent (33 percent minus 9 percent) of the needed opportunities for universal coverage were available and were allocated equitably.[21] In Jamaica, however, 88 percent of children completed primary education on time (table 2.2), and only 2 percent of opportunities were not allocated equitably (table 2.4). Hence, 86 percent of needed opportunities for universal access were available and distributed fairly.

The Human Opportunity Index for education improved in the region for both indicators. The average of the index over all the countries for finishing sixth grade on time went from 49 percent in the mid-1990s to 62 percent in 2005. For the same period, school attendance for those ages 10 to 14 increased from 86 percent to 90 percent. Likewise, the index for housing conditions rose for the three indicators considered. Equal opportunity in access to water increased from of 61 percent to 67 percent, on average. In sanitation, the average grew from 38 percent to 43 percent, while in electricity it went from 72 percent to 78 percent.

Table 2.6 Human Opportunity Indexes in Education

	Sixth grade on time			*School attendance (ages 10–14)*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	82	—	—	95	—
Bolivia	—	73	—	—	94	—
Brazil	15	37	2.2	87	96	0.9
Chile	73	81	0.7	97	98	0.1
Colombia	50	67	2.9	86	88	0.4
Costa Rica	56	65	0.9	85	92	0.7
Dominican Republic	45	58	1.3	95	97	0.1
Ecuador	62	75	1.3	78	84	0.6
El Salvador	28	43	2.3	81	86	0.8
Guatemala	16	24	1.5	75	77	0.3
Honduras	35	45	1.3	70	78	1.1
Jamaica	87	86	−0.1	95	94	−0.1
Mexico	68	84	1.6	86	93	0.7
Nicaragua	23	33	1.5	76	85	1.2
Panama	67	70	0.6	89	91	0.3
Paraguay	45	59	2.4	91	89	−0.2
Peru	52	72	2.5	92	94	0.2
Uruguay	—	75	—	—	95	—
Venezuela, R. B. de	62	73	1.1	92	94	0.2
Average	**49**	**62**	**1.5**	**86**	**90**	**0.5**

Source: Authors' calculations based on household surveys.

Note: — = Not available.

Of interest is that those indicators with a higher regional average also show lower dispersion across countries. For instance, school attendance for those ages 10–14 averages 90 percent (the highest of all five indicators), and individual country indexes vary within a 22 percentage point range. Conversely, the index for sanitation averages 43 percent (the lowest) with country indexes varying nearly 80 percentage points. This means that some basic opportunities, such as late primary (or early secondary) school attendance and access to electricity, have advanced in almost every country of the region. However, sanitation and finishing sixth grade on time show large disparities from one country to another.

A brief perusal of the data leads to two main observations. First, countries can rank differently when measuring different opportunities. For instance, Jamaica performs highly for education but poorly for improved water and sanitation. Some countries, however, rank consistently across dimensions. Chile has good results in all five dimensions whereas Nicaragua has low

Table 2.7 Human Opportunity Indexes in Housing Conditions

	Water			*Sanitation*			*Electricity*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	90	—	—	76	—	—	98	—
Bolivia	—	51	—	—	19	—	—	53	—
Brazil	85	91	0.7	37	49	1.2	81	92	1.1
Chile	84	94	1.0	67	87	2.0	93	99	0.6
Colombia	68	71	0.6	46	48	0.3	86	89	0.5
Costa Rica	80	97	1.6	69	88	1.9	93	98	0.4
Dominican Republic	—	60	—	—	46	—	—	91	—
Ecuador	53	66	1.2	40	49	0.8	81	90	0.9
El Salvador	36	45	1.3	16	16	0.0	65	76	1.6
Guatemala	54	63	1.3	11	20	1.6	57	66	1.6
Honduras	—	66	—	—	21	—	42	45	0.3
Jamaica	52	47	−0.9	37	36	−0.2	73	83	1.8
Mexico	72	85	1.3	28	43	1.5	90	98	0.8
Nicaragua	39	41	0.3	8	11	0.5	46	49	0.6
Panama	77	81	0.7	28	30	0.4	53	59	0.9
Paraguay	28	45	2.8	36	42	1.1	83	91	1.4
Peru	40	44	0.5	29	49	2.5	47	54	0.9
Uruguay	—	85	—	—	73	—	—	97	—
Venezuela, R. B. de	88	87	−0.1	77	82	0.5	98	98	0.0
Average	**61**	**67**	**0.9**	**38**	**43**	**1.0**	**72**	**78**	**0.9**

Source: Authors' calculations based on household surveys.

Note: — = Not available.

records in all. Second, some countries have made consistent progress in all categories while others demonstrate unbalanced performance over time. Countries like Brazil and Mexico have increased across all indexes, while other countries—Jamaica, Paraguay, Peru, and República Bolivariana de Venezuela—have stagnating or even receding indexes.

Summary Indexes

This section presents a summary index that incorporates all five indicators into two dimensions of children's opportunities—education and housing conditions. These two dimensions are then summarized in a single Human Opportunity Index. The overall Human Opportunity Index is a simple average of the country indexes along the two dimensions. [22] Each dimension has a summary index itself. For education it is the simple average of the two indicators, and for housing conditions it is the simple average of the three indicators.

The Human Opportunity Index can be read as that proportion of total available opportunities that has been distributed according to the principle of equality of opportunity. For example, if the Human Opportunity Index is 60 percent, it means that 60 percent of available opportunities in housing conditions or education are equally distributed among the population of children. Similarly, the summary index for each dimension equals the proportion of the available opportunities that are distributed according to the principle of equality of opportunity. For instance, a summary index in housing conditions of 60 percent means that 60 percent of the available opportunities for access to water, sanitation, or electricity are distributed equally across different circumstance groups of children.

The interplay between the scores of the education and housing indexes (table 2.8) and the overall Human Opportunity Index (table 2.9) is revealing. Chile ranks at the top of the Human Opportunity Index because it is a good performer in all dimensions (top place in both education and housing conditions). In the summary index for education, Chile and Jamaica have indexes of 90 percent, and in the summary for housing conditions, Chile and Costa Rica have indexes above 90 percent. At the other end of the spectrum, Bolivia, El Salvador, Guatemala, Honduras, Jamaica, Nicaragua, Panama, Paraguay, and Peru have housing conditions summary indexes of at most 60 percent. Only Nicaragua and Guatemala have such low indexes for education. Consequently, these two countries register a low score in the overall Human Opportunity Index. Jamaica stands out because of its top rank in education and low rank in water and sanitation. These extreme results lead the country to be placed in a middle position.

Just as interesting as the level of the Human Opportunity Index are its recent changes (figure 2.2): almost all countries in the region have recorded increases in the index for the period under study. Some countries have expanded remarkably—Brazil, El Salvador, Guatemala, Mexico, Par-

Table 2.8 Summary Opportunity Indexes for Education and Housing Conditions

	Opportunity index for education			*Opportunity index for housing conditions*		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	89	—	—	88	—
Bolivia	—	83	—	—	41	—
Brazil	51	67	1.6	68	77	1.0
Chile	85	90	0.4	81	93	1.2
Colombia	68	78	1.7	67	69	0.5
Costa Rica	70	79	0.8	81	94	1.3
Dominican Republic	70	77	0.7	—	65	—
Ecuador	70	80	0.9	58	69	1.0
El Salvador	54	65	1.5	39	46	1.0
Guatemala	45	51	0.9	41	50	1.5
Honduras	52	62	1.2	—	44	—
Jamaica	91	90	−0.1	54	55	0.2
Mexico	77	88	1.2	63	75	1.2
Nicaragua	49	59	1.3	31	34	0.4
Panama	78	81	0.4	53	57	0.6
Paraguay	68	74	1.1	49	59	1.8
Peru	72	83	1.4	38	49	1.3
Uruguay	—	85	—	—	85	—
Venezuela, R. B. de	77	84	0.7	87	89	0.2
Average	**67**	**76**	**1.0**	**58**	**64**	**0.9**

Source: Authors' calculations based on household surveys.

Note: — = Not available.

aguay, and Peru have all increased the Human Opportunity Index by more than 1.2 percentage points yearly. It is particularly notable that countries like Brazil and El Salvador, which started from relatively low initial levels of the index (59 percent and 47 percent, respectively) are now among the fastest growers in the region. Other countries (Panama and Nicaragua) with similar initial conditions have not had comparable growth.

A similar comparison can be made of countries with high initial levels, such as Chile and República Bolivariana de Venezuela; both were above the 80 percent mark in the mid-1990s, but experienced different results over the period. Chile increased its Human Opportunity Index by 8 percentage points in a decade, but República Bolivariana de Venezuela by only 4 percentage points. These examples show there is room for policy options with regard to expansion of the index.

Table 2.9 Human Opportunity Index

	Human opportunity index		
Country	*Circa 1995 (percent)*	*Circa 2005 (percent)*	*Annual change*
Argentina	—	88	—
Bolivia	—	62	—
Brazil	59	72	1.3
Chile	83	91	0.8
Colombia	67	74	1.1
Costa Rica	76	86	1.1
Dominican Republic	—	71	—
Ecuador	64	74	0.9
El Salvador	47	55	1.2
Guatemala	43	50	1.2
Honduras	—	53	—
Jamaica	72	73	0.1
Mexico	70	82	1.2
Nicaragua	40	46	0.9
Panama	65	69	0.5
Paraguay	58	67	1.4
Peru	55	66	1.4
Uruguay	—	85	—
Venezuela, R. B. de	82	86	0.4
Average	**63**	**70**	**1.0**

Source: Authors' calculations based on household surveys.

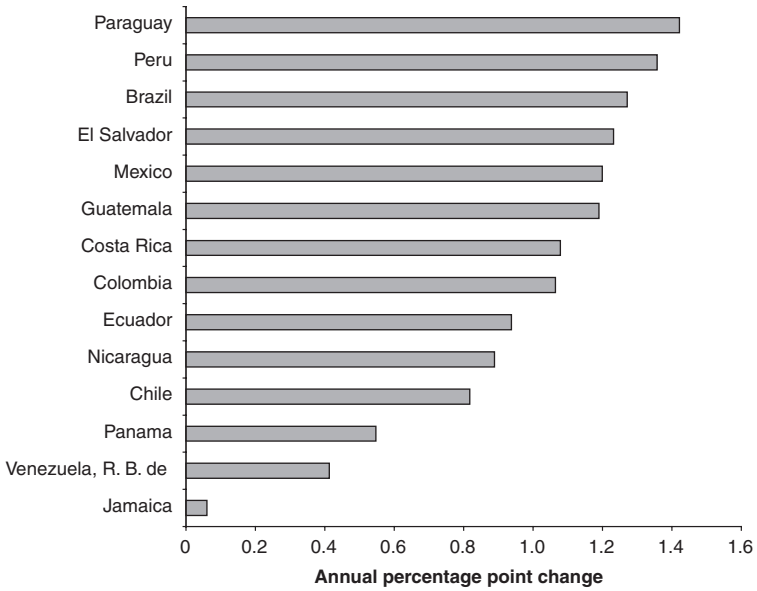
Note: — = Not available.

Looking at the initial level of the Human Opportunity Index in 1995 and at the level of changes during 1995–2005, we could identify four "types" of countries. Some countries started with a low index and made significant improvements, like Brazil. Other countries started with a low index and made uneven progress, e.g., Nicaragua.[23] There are countries that started with a high index and made little progress, like República Bolivariana de Venezuela. However, the overall situation in this type of country might not be quite as worrisome because the original high level to some extent restricts their potential for growth. Nevertheless, some countries, despite a high initial level of the Human Opportunity Index, have managed to post a relatively high pace of growth, e.g., Costa Rica.

Summary and Conclusions

Equality of opportunity ensures that basic goods and services are distributed among children without correlation to circumstances such as gender,

Figure 2.2 Changes in the Human Opportunity Index, circa1995–2005



Source: Authors' calculations.

family background, or location. The Human Opportunity Index provides an instrument to gauge advances in equality of opportunity over time for a country and to compare performance across countries. It can be interpreted as a social welfare function that reacts to both changes in overall access to basic opportunities for children, as well as to their equitable distribution.

The Human Opportunity Index can help policy makers track progress toward providing a set of basic opportunities to all children within a society. The index indicates what portion of total available opportunities are allocated equitably, encompassing not only the coverage of a given basic opportunity, but also the way available resources are allocated. If policy makers seek to expand services without regard to distributional concerns, the index will grow slowly. However, pure redistribution of given resources would not suffice to accelerate the growth of social welfare. Only by combining expansion of coverage with equal allocation of opportunity will the growth of the Human Opportunity Index be maximized. Obviously, costs considerations are key in the allocation of resources, but that is beyond the scope of the discussion here.

Five basic opportunities are considered in this chapter: completion of sixth grade at age 13, school attendance for children ages 10 to 14, and access to water, sanitation services, and electricity for children ages 0 to 16. These five basic opportunities are aggregated into a summary index for education (the first two) and a summary index for housing conditions (the last three). The average of these two indexes constitutes an overall Human Opportunity Index that condenses into a single number the level of equality of opportunity in a country. The predetermined circumstances comprised gender, place of residence (urban or rural), years of schooling of the family head, family composition (single parent and number of children at home), and per capita income. Data from 36 nationally representative household surveys for 19 Latin American and Caribbean countries were used over a period of approximately a decade (1995–2005). These surveys represent nearly 200 million children in the region.

Most countries in the region show advances in the index for the period, although some registered setbacks. The main findings of the exercise are summarized in the following:

- The index for education, as calculated from surveys taken in or near 2005, ranges from a maximum of 90 percent for Jamaica and Chile to a minimum of about 50 percent for Guatemala. During the decade preceding 2005, Brazil, Colombia, and El Salvador registered the fastest increases in this index, above 1.5 percentage points a year, while Jamaica's decreased slightly.
- The index for housing conditions, again based on surveys taken in or near 2005, indicates that Argentina, Chile, Costa Rica, Uruguay, and República Bolivariana de Venezuela all have indexes above 85 percent. Bolivia, El Salvador, Guatemala, Honduras, Jamaica, Nicaragua, and Peru all rank low, with indexes below 50 percent. The largest changes for water and sanitation took place in Chile, Costa Rica, Guatemala, Mexico, Paraguay, and Peru with improvements of more than 1.2 percentage points.
- The Human Opportunity Index, which averages the indexes for education and housing conditions, is above the 80 percent mark for Argentina, Chile, Costa Rica, Mexico, Uruguay, and República Bolivariana de Venezuela, and below the 60 percent mark for El Salvador, Guatemala, Honduras, and Nicaragua. The larger advances in this index were observed in Brazil (1.3 percentage points per year), Mexico, El Salvador, and Guatemala (1.2 percentage points per year), and Paraguay (1.4 percentage points per year).

The compilation of statistical evidence for the region shows that the Human Opportunity Index has two salient regularities. First, countries with low coverage of a given basic opportunity also show large inequality in its distribution, which indicates that there is room for rapid expansion

of the Human Opportunity Index through increasing the prevalence of basic opportunities while taking special care in the distribution of these increments. Second, heterogeneity is evident in the recent evolution of changes in the Human Opportunity Index. Comparing countries with similar initial positions illustrates that some countries have had remarkable increases while others have stagnated. This implies that there is margin for policy makers to identify areas of potential progress and lead advances in the Human Opportunity Index.

The countries, time periods, circumstance variables, and basic opportunities chosen for this study can be modified as necessary for future studies. Choices can be made according to the way in which a given society defines basic opportunities, the circumstance characteristics that might be most relevant in a country, and data availability. The selection of basic opportunities is open to debate and can be modified in other studies. The incorporation into the analysis of additional basic opportunities would provide a more complete and accurate portrait of a country's social reality. For instance, an index could incorporate other indicators, such as nutrition and immunization, to add a health dimension, and birth certificates to add a civil franchise dimension. Further possibilities for the index and its applications are discussed in the next chapter.

Notes

1. Mathematically, the Human Opportunity Index, O, will be given by $O = \bar{p} \times (1-D)$.

2. Several basic opportunities that might be of interest, such as preschool education or having a birth certificate, were not incorporated in the analysis because of lack of data from several countries.

3. This probability was computed by a logistic model conditioned on age and other control variables. For a formal treatment, see Barros, Molinas, and Saavedra (2008). A typical Latin American formal educational system starts at age six, with about six years of primary school and six years of high school. Most countries depart from this benchmark in different directions. "Completing sixth grade" means having completed six years of education on time in the first basic level of the country. In 10 countries of the region, this means completing primary education. But it is less than primary in other countries and more in Colombia. In most countries, basic education officially starts at age six (Brazil, Guatemala, and Nicaragua, start at seven), so by age 13, students that have survived in the system without repetition or interruption should have completed six years of basic education.

4. Anecdotal evidence indicates there were potentially large impacts on the quality of education among poor rural children in Arahuay (Peru) after machines from the One Laptop per Child project reached the local school (Bajak 2007). Without electricity in this rural village this project would not have been possible. The under-US$200 laptops are specially designed to educate children (ages 6–16 years) and to suit local language and customs, are loaded with copyright-free books, and allow children to master the Internet. Peru has bought more than 270,000 machines and Uruguay has ordered 100,000.

5. This does not include public well (*pilón, puesto público, pluma, llave pública*), truck (*camión cisterna*), rain, river or pond, and the like. The only exception is República Bolivariana de Venezuela, in which a public well is accepted by the study as an improved water system. This has a reason. In all surveys from 1995 on, general access to water systems from the public network was almost universal (between 90 and 93 percent) and public well access was almost 0 percent. But for the 2005 survey "Encuesta de Hogares Por Muestreo," the data are completely different. Public network connections represented only 73 percent of access and public wells represented 17 percent. Data from 2006 confirm that public network connections are available to over 90 percent of the general population, but that survey provides no way to create the urban dummy variable that is critically needed for this study.

6. Our definition of improved sanitation is stricter than that from other sources. For example, WHO-UNICEF's Joint Monitoring Programme for Water Supply and Sanitation considers different types of latrines to be improved sanitation, but they are excluded from our definition.

7. For education, gender refers to the child's gender; however, for water, sanitation, and electricity, gender refers to the gender of the household head.

8. Argentina has no nationally representative sample that includes rural areas, with the only nationally representative survey available to our knowledge being a special survey carried out by the World Bank to assess the effects of the 2002 economic crisis. Because national estimates and urban-only estimates are not strictly comparable, this chapter uses the results of the 2002 national survey for Argentina. However, the national estimates for 2002 give remarkably similar results to the urban-only estimates in 2003. Knowing that 2002 was an atypical year for Argentina, the results are to be interpreted with extreme caution.

9. Averages for the final period do not include Argentina and Uruguay, so that initial and final period averages are comparable. Besides, final period averages do not include Bolivia, the Dominican Republic, and Honduras for some indicators. This is due to lack of information in a given survey or comparability problems between surveys.

10. A more formal discussion of this procedure is presented in Barros, Molinas, and Saavedra (2008).

11. As an example, it is possible to assume that differences in access to sanitation among children that are related to circumstances are all inequalities in opportunity, because having or not having the "basic opportunity" is exogenous for the child. However, when an adult has or does not have access to sanitation, the outcome is partly related to differences in opportunity (low public sector investment) and partly related to the effort of the individual.

12. The methodological proposal relies heavily on traditional sociological and demographic studies in three areas: inequality of educational opportunities (see Boudon 1973 and Mare 1980), residential and occupational segregation (Duncan and Duncan 1955), and the measurement of the inequality of opportunity to survive (see, for instance, Koskinen [1985] and Barros and Sawyer [1993]).

13. For a formal proof of the range of the *D*-index, see Barros, Molinas, and Saavedra (2008).

14. Specific access rates are fitted for each individual pertaining to a given group. For details on the econometric methods used, see Barros, Molinas, and Saavedra (2008).

15. The sociological literature usually divides by either the proportion of a bad outcome $(1 - \overline{p})$ or by the product $\overline{p} \times (1 - \overline{p})$. These types of denominators tend to penalize growth of opportunities distributed at random. By dividing by $\overline{p}$, the measure exhibits some pro-growth bias. For further discussion, see Barros, Molinas, and Saavedra (2008).

16. The circumstances analyzed here—place of residence, gender, and several household characteristics—were used because comparable data were available from household surveys in all 19 countries of the LAC region. Should data become available on other potentially important circumstances, such as ethnicity or religion, for example, these can be incorporated into the index.

17. All averages across countries in this section refer to simple averages. Only countries with two data points are included in the average.

18. As complementary information, the study also calculated *D*-indexes for completion of third grade on time, school attendance for children ages 10–14, and literacy at age 15, circa 2005. The levels of inequality of opportunities for these complementary indicators are much smaller than the level for completion of sixth grade on time: only 1 percent on average across all countries regarding literacy at age 15, 3 percent for school attendance for children ages 10–14, and 8 percent for completing third grade on time, as compared to 12 percent in completing sixth grade on time. Nonetheless, the relative ranking of countries stays roughly similar

19. In a strict sense, D is not defined when $\overline{p} = 0$. A close substitute, $D1$, has to be used. More specifically,

$$D1 = \frac{1}{2} \sum_{i=1}^{m} \beta_i \mid p_i = \overline{p} \mid$$

and $D = (D1/\overline{p})$. For this example, $D1 = 0$. See Barros, Molinas, and Saavedra (2008) for more details.

20. For a formal derivation of these and other properties of the Human Opportunity Index, see Barros, Molinas, and Saavedra (2008).

21. Important improvements in education observed in Guatemala after 2006 could change this estimate.

22. Because the Human Opportunity Index is a simple average, the opportunities are assumed to be perfect substitutes within each dimension, and each dimension is a perfect substitute for the other.

23. Nicaragua shows very little progress in the Human Opportunity Index, even though important advances have been achieved in other fronts such as reducing the poverty gap, reducing infant and child mortality, and increasing access to paved roads.

References

Abou-Ali, Hala. 2003. "The Effect of Water and Sanitation on Child Mortality in Egypt." Unpublished. Environmental Economics Unit, Department of Economics, Göteborg University, Sweden.

Bajak, F. 2007. "In Peru, a Pint-Size Ticket to Learning: Officials Hope 270,000 Laptops for Poor Youngsters Improve Education System." *Washington Post*, December 30, A18.

Barros, Ricardo Paes de, and Diana Sawyer. 1993. "Unequal Opportunity to Survive: Education and Regional Disparities in Brazil." Texto para discussão No. 307, julho de 1993.

Barros, Ricardo Paes de, J. R. Molinas, and J. Saavedra. 2008. "Measuring Inequality of Opportunities for Children." Unpublished, World Bank, Washington, DC. www.worldbank.org/lacopportunity.

Boudon, R. 1974. *Education, Opportunity, and Social Inequality*. New York: Wiley.

Budlender, D., N. Chobokoane, and Y. Mpetsheni. 2001. *A Survey of Time Use: How South African Women and Men Spend Their Time*. Pretoria: Statistics South Africa.

Duncan, Otis, and Beverly Duncan. 1955. "A Methodological Analysis of Segregation Indexes." *American Sociological Review* 20 (2): 210–17.

Fuentes, Ricardo, Tobias Pfütze, and Papa Seck. 2006. "A Logistic Analysis of Diarrhea Incidence and Access to Water and Sanitation." Human Development Report Occasional Paper, UNDP, New York.

Galiani, Sebastian, Paul. J. Gertler, and Ernesto Schargrodsky. 2005. "Water for Life: The Impact of the Privatization of Water Services on Child Mortality." *Journal of Political Economy* 113: 83–120.

Gustavsson, M. 2007. "Educational Benefits from Solar Technology: Access to Solar Electric Services and Changes in Children's Study Routines, Experiences from Eastern Province Zambia." *Energy Policy* 35 (2): 122–29.

Koskinen, S. Time. 1985. "Trends in Cause-Specific Mortality by Occupational Class in England and Wales." Unpublished paper presented at IUSSP 20th General Conference, Florence, Italy.

Mare, R. D. 1980. "Social Background and School Continuation Decisions." *Journal of the American Statistical Association* 75: 295–305.

Kaufman, S., R. Duke, R. Hansen, J. Rogers, R. Schwartz, and M. Trexler. 2000. "Rural Electrification with Solar Energy as a Climate Protection Strategy." Research Report Number 9, Renewable Energy Policy Project, Washington, DC.

Rutstein, Shea O. 2000. "Factors Associated with Trends in Infant and Child Mortality in Developing Countries during the 1990s." *Bulletin of the World Health Organization* 78 (10): 1256–70.

Sen, A. 1976. "Real National Income." *Review of Economic Studies* 43: 19–39.

WHO (World Health Organization). 2002. *The World Health Report 2002: Reducing Risks, Promoting Healthy Life*. Geneva, Switzerland.

World Bank. 2006. *World Development Report 2006: Equity and Development*. Washington, DC: World Bank.