

Multidimensional Human Opportunity Index

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Abstract One fact that emerges from the evaluation of the Millennium Development Goals is that not all countries met all the goals and there are significant complementarities among failing on specific goals. This paper proposes the Multidimensional Human Opportunity Index (MHOI) that focuses on the complementarities among access to multiple services. We focus on access to services for children, with the aim of capturing equality in opportunity for children from diverse socio-economic backgrounds. This index builds on the Human Opportunity Index of the World Bank that measures children's access to a basic service, such as access to clean water. However, the MHOI differs from the parent index in that we measure joint access to multiple services or access to a bundle of services. We apply the MHOI on two Himalayan states of South Asia, Nepal and Bhutan, and show that although each basic service is available to a large proportion of the population, only two-thirds in Bhutan and one half in Nepal have access to the bundle of basic services in 2011–2012.

Keywords Multidimensional · Equality of opportunity · Poverty

JEL Classification D72 · D78 · O20

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1 Introduction

The evaluation of the Millennium Development Goals (MDGs) shows that there are several countries that fell short in meeting all the goals. Furthermore, among those that fell short, there are complementarities between shortfalls. Countries that fail to meet one goal are more likely to also not achieve the other goals. The discussion of the road ahead of the MDGs would necessarily bring into forefront the discussion about these complementarities. Along with broadening the scope of the goals there will also be a need for broad based measures. This paper introduces one such index, the Multidimensional Human Opportunity Index (MHOI) that can help policymakers identify and measure the level of access of different complimentary services. The focus here is on equal access of a bundle of basic services provided to children, despite the difference in their socio-economic status. This would in turn bring about equality of opportunity for all children, making their initial conditions irrelevant for their future achievements.

The MHOI introduced in this paper measures equality of opportunity in access to a *bundle* of services and how socio-economic factors outside the control of the child affect her ability to tap into these services. There are two crucial elements of this index. First, it looks at equality of opportunity among children. The idea here is, by providing equal access to all children of this bundle of services, we create a more egalitarian society, where individual outcomes are not driven by circumstances they faced in their childhood. This aspect of our index borrows from the Human Opportunity Index (HOI) framework of the World Bank. The second salient feature of the index is that we are concerned with the access to a bundle of services and not access to individual services provided independently. In doing so we focus on the complementarities in the provision of services and are able to directly reward a holistic approach to development. To develop this aspect we rely on the Alkire and Foster (2011) multidimensional poverty framework.

The equality of opportunity framework is conceptually linked to the concept of upward mobility (Sen 1980). Without removing differences in access to basic services, society cannot bring about upward mobility of disadvantaged groups. The intergenerational mobility literature that subsequently spawned from the model of Becker and Tomes (1986) also provides evidence to this notion.¹ For sustained poverty reduction it is important to divorce the access children have to certain basic services (such as education, health, etc.) from characteristics that they inherit from their parents. If family variables are inadequate to ensure a higher standard of living for offsprings in their adult life, then favorable neighborhood variables could be used to ensure that as research has shown that community variables can affect the future outcomes of an individual (Aaronsen 1998; Datcher 1982; Durlauf 1996; Islam 2013).²

¹ This literature shows that the correlation of income between fathers and sons is very high in the US (Lee and Solon 2009; Mazumder 2005; Solon 1992; Zimmerman 1992), which can reduce upward mobility of an individual born to poor parents. The evidence from other countries is mixed; in countries like Britain and Germany, intergenerational mobility is low Wiegand (1997), while it is high in Finland and Sweden (Osterbacka 2001; Osterberg 2000). Evidence from Latin American countries and China show that mobility is much lower in those countries when compared to that seen in the US (Behrman et al. 2001; Ferreira and Veloso 2006; Gong et al. 2012). Currie (2009) show that children who are born into poor families do have a lower birth weight, worse health and learning outcomes than children born into richer families. Access to proper healthcare and education could improve the chances of a child having a favorable adult life.

² Although some papers do not find improvements in a community leading to improvements of individual outcomes in the short run (Kling et al. 2005; Katz et al. 2001), recent research by Chetty et al. (2015) shows that neighborhood quality can have an effect on individual outcomes. Neighborhood school quality can increase returns to schooling of an individual (Altonji and Dunn 1996), which shows the importance of proper and quality services in improving the future outcomes of a child.

The idea of linking childhood circumstances with their access to basic services is not new. The HOI is one such measure that does so, but it looks at the access to each basic service piecemeal. However, it can be valuable information for a policymaker or researcher to create a single measure that shows the overall access to a *bundle* of basic services by children from different backgrounds, because it can directly recognize the complementarities in the provision of public goods. The MHOI we create in this paper does exactly that—it combines the HOI measure of access to basic services by the World Bank with the multidimensional poverty approach proposed by UNDP into one index. This index can measure access to a bundle of services, each of which complements the other, thus enabling the citizens to get the maximum benefit out of each basic service.

To demonstrate the value added of this approach we apply the index to two South Asian countries. We chose to focus on South Asia, since the equality of opportunity framework has not yet been used on this region.

We use three waves of the Bhutan Living Standards Survey (BLSS) and two waves of Nepal Living Standards Survey (NLSS) for this analysis. The BLSS (NLSS) is a nationally-representative survey that measures the living conditions of the households in Bhutan (Nepal). Using this dataset, we select five basic services that are essential for maintaining a basic standard of living in Bhutan and Nepal. We then measure the MHOI among the children of these two countries. We find that the inequality of access across households across Bhutan has also fallen between 2003 and 2012. Although we find that about 80 percent of the household in Bhutan had access to one of the basic services in 2012, only about 63 percent of the household have access to all five basic services collectively. For Nepal the MHOI is lower when compared to that of Bhutan, but Nepal has made some great strides to raise the level of access to the bundle of services to its citizens. The MHOI of Nepal has increased substantially between 2003 and 2011 from a value of 14.5 to 37.4. However, only about 50 percent of the household in Nepal had access to all five services collectively in 2011.

The rest of the paper is organised as follows: the next section derives the MHOI and describes the properties that are satisfied by it. In Sect. 3 we have collected the results from the empirical exercise for Nepal and Bhutan and Sect. 4 concludes the paper.

2 The Multidimensional Human Opportunity Index (MHOI)

2.1 The Human Opportunity Index (HOI)

The HOI is a framework that is used to incorporate the equality in opportunity that *children* have in the access to basic services that are deemed necessary for their growth and overall development. It is a measure of coverage that penalizes for unequal distribution of this coverage over certain groups. When thinking of equality of opportunity, the vulnerable groups are the groups of children who come from households that are disadvantaged. The children themselves have no control on these circumstances and so a measure of access that accounts for equality should not have unequal and lower access for children from such families. The HOI focuses on children because it can look at exogenous circumstances during their childhood which can potentially affect their future outcomes. (see Barros et al. (2009) for a detailed description of the HOI). We next present the mathematical formulation of the HOI. However we need some notation for this, and that is presented first.

We assume there is a community of N total individuals, $i \in N$. Let us define a bundle of services which are essential for the overall development of a child. Let this bundle have a total of D services, $d \in D$. These could include distance to school, electricity at home, distance to the nearest health centre, access to a clean and hygienic home, access to clean drinking water, access to telephone, etc. Let this bundle have D total services, with d denoting a specific service.³

For each individual, i in the population with N children the vector x defines the circumstances, outside her control, that affect her chances to access the bundle Z . Let X denote the set of circumstances. Each $i \in N$ is a member of $x \in X$. Let y be a $N \times D$ matrix. Each element of y , y_{id} that lists the level of access individual $i \in N$ has for a certain service d .

Let μ be the nation-wide proportion of individuals with access to a certain opportunity, such as access to clean water, and let $\mu(x)$ be the proportion of individuals in group x that has access to that opportunity. If $\mu(x) < \mu$, then the group is said to be in the vulnerable group V^C , and if $\mu(x) \geq \mu$ then the group is said to be a non-vulnerable group V . The HOI index $\theta(x)$ is the mean of the overall access to a particular opportunity (μ) minus the average shortfall of that opportunity among those who are in the vulnerable group $E(\mu - \mu(x)|x \in V^C)$:

$$\theta(x) = \mu - E(\mu - \mu(x)|x \in V^C) \quad (1)$$

Thus, the more unequal the access the lower is the value of HOI, when compared to the overall access μ . Similarly, the more equal the access is across groups, the closer the value of HOI is to μ . This provides a measure of equality in opportunity in access to a single service. Repeating this exercise for each service we have a dash-board of services.

Though a dash-board is helpful in providing a list of shortfalls, it has one serious omission—it does not capture the extent of *joint* failure over multiple services. In the poverty literature this has been addressed by using a multidimensional criteria to measure poverty that explicitly takes into account the overlap in deprivation in the various dimensions. One such method is the counting approach by Alkire and Foster (2011). In order to identify the poor, they use two poverty lines—the first identifies deprivation in each dimensions and the second counts the number of dimension that an individual has to be deprived in to be considered poor. This allows individuals with deprivations in only a few dimensions not to be termed as poor. We bring this additional layer of identification to the HOI to move it from a single service to measuring access to a *bundle* of services simultaneously.

2.2 Deriving the MHOI

We use a two-step procedure to derive the MHOI. In the first step we define access to each service and in the second step we define access to a bundle of services and then accordingly calculate the HOI for the inequality in access to this bundle following the procedure described above for the HOI.

Step 1: We determine access to each specific service. This step is basically the same that used to calculate the service specific HOI. We use a service specific cutoff—if anyone has more than the cutoff value, then that person is said to have access to that service; otherwise

³ For each of the services we assume that the metric we use to quantify access has a lower and upper bound signifying no access and complete access, respectively.

that person does not have access to that service. Let P = the set of cutoff values for all the service $1, 2, \dots, D$. Thus $p \in P$. If $y_{id} \geq p_d$, then that person has access to service d ; otherwise, that person does not have access to d .

Step 2: We then identify individuals who do not have access to the bundle of services. For our main results, person $i \in N$ is considered to be disadvantaged if they lack access to *any one* of the services. If a person i has access to *all* the services then that person is said to be not disadvantaged. This is a very strict definition and when there are several services included then the children without access would be large proportion of the population. So for robustness we use other cutoffs where is assumed to have access to the bundle if one have certain number k of services.

Thus, the proportion of the population that has access to all the services in the bundle is given by:

$$\mu(y) = E \left(\prod_{d=1}^D [y_{id} \geq p_d] \right) \tag{2}$$

and the proportion of individuals with circumstance $x \in X$ that have access to all the services is given by the following:

$$\mu(y; x) = E \left(\prod_{d=1}^D [y_{id} \geq p_{id} \mid x \in X] \right) \tag{3}$$

Therefore, a group with circumstance $x \in X$ is said to be in the vulnerable group V^C if $\mu(x) \leq \mu(y)$, and group with circumstance $x \in X$ is said to be in the non-vulnerable group V if $\mu(x) > \mu(y)$. The excess/shortfall that group with circumstance $x \in X$ has is measured by $\pi(x) = \mu(y) - \mu(x)$. $\pi(x) \geq 0$ if $x \in V^C$ and $\pi(x) < 0$ if $x \in V$.

Therefore, the multidimensional HOI is:

$$\theta(y; x) = \mu(y) - E[\pi(x) \mid x \in V^C] \tag{4}$$

2.3 Extension

Now, if we want to define an individual having access to bundle Z if she has access to k or more of the D services in the bundle, we first need to count the number of services individual i has access to:

$$c_i(y; x) = \sum_{d=1}^D (I[y_{id} \geq p_d]) \tag{5}$$

where $I[\]$ is a function which takes the value 1 when the statement within the parenthesis is true and 0 otherwise. Therefore c_i gives the number of services that the individual has access to. In the main index of the previous section, an individual is said to have access to the bundle if she has $c_i = k = D$, that is she has all services available to her. But we can relax this assumption by assuming that individual has access to the bundle is she has access to $k < D$ of the services. Therefore the individual is said to have access to the bundle if she has access to more than k of the services. Therefore the new mean access for the population is given by the following (this depends on the value for k):

$$\mu_k(y) = E(I[c_i(y;x) \geq k]) \quad (6)$$

and the proportion of individuals with circumstance $x \in X$ that has access to all the services is given by the following:

$$\mu_k(y;x) = E(I[c_i(y;x) \geq k \mid x \in X]) \quad (7)$$

and finally the MHOI for any k is given by:

$$\theta_k(y;x) = \mu_k(y) - E(\mu_k(y) - \mu_k(y;x) \mid x \in V^C) \quad (8)$$

We use all the possible values of k in our empirical exercise to show the robustness of our comparison.

2.4 Properties of the Multidimensional Human Opportunity Index

We now evaluate our index using the axiomatic approach. The framework draws heavily on the axiomatic properties of the unidimensional human opportunities index. There are some additional properties that are similar to multidimensional poverty literature.

2.4.1 Replication Invariance

If y' is obtained from y by a replication, then $\mu_k(y;x) = \mu_k(y';x)$. This property ensures that our measure is relative to population size and so, it allows comparison across populations of different sizes. This can be further extended to say that if the population of each group $x \in X$ is replicated, and y' is obtained from y from that replication, then too, $\mu_k(y;x) = \mu_k(y';x)$

2.4.2 Asymmetry

If y' is obtained from y by a permutation, $y' = \Pi y$, then $\mu_k(y';x) \neq \mu_k(y;x)$.⁴ Most poverty indices are symmetric, in so far that permutations don't affect the overall poverty number. However for the equality of opportunity we precisely do not want the index to be symmetric so that disadvantaged groups can be identified and improved.

2.4.3 Monotonicity to Circumstances

Let b be an additional set of characteristics that can potentially affect the distribution of access. Then the monotonicity property states that $\mu_k(y;x) \geq \mu_k(y;x,b)$. This property ensures the index cannot be improved merely by adding another set of circumstances to the existing set X .

The next set of properties is to check the orientation of the index. We define a simple increment as when y' is obtained from y by improving access for at least one individual without reducing the access for any other individual. Further a dimensional increment among the deprived is defined as when it provides access to that dimension to a person who did not have access.

⁴ A permutation matrix Π is a square matrix with a single '1' in each row and each column, and the rest '0's.

2.4.4 Weak Monotonicity

If y' is obtained from y by a simple increment then $\mu(y'; x) \geq \mu(y; x)$.

2.4.5 Dimensional Monotonicity

If y' is obtained from y by a dimensional increment then $\mu(y'; x) \geq \mu(y; x)$.

Weak monotonicity ensures that an increment in the availability of a service by any individual does not reduce the overall MHOI and dimensional monotonicity ensures that providing access to more people is registered as a non-negative change with the MHOI. Monotonicity to circumstances ensures that the index cannot be rigged to give better performance by introducing additional (potentially unnecessary) circumstances.

The next property deals with changes in inequality in the distribution. If we were to 'average' the achievements of two individuals i and i' , who earlier did not have access to the bundle, in which person i receives $\lambda > 0$ for the first vector and $1 - \lambda$ of the second vector, with the shares reversed for i' . In general, y' is obtained from y by averaging of achievements among the deprived if $y' = By$ for some $n \times n$ bistochastic matrix, B satisfying $b_{ji} = 1$ for every person with access in y .

2.4.6 Weak Transfer

If y' is obtained from y by an averaging of achievements among the deprived, then $\mu(y'; x) \geq \mu(y; x)$.

The index satisfies some of the standard basic properties. In the next section we apply our index to data from Bhutan and Nepal.

3 Empirical Exercise: Bhutan and Nepal

3.1 Data

We use the 2003, 2007 and 2012 rounds of the Bhutan Living Standards Survey (BLSS) and the 2003 and 2011 rounds of the Nepal Living Standards Survey (NLSS) to calculate the Multidimensional Human Opportunity Index. The BLSS is a survey of households in Bhutan that has been undertaken by the National Statistics Bureau (NSB) of Bhutan, with technical and financial assistance from the Asian Development Bank (Bhutan Living Standards Survey 2012 Report 2013).

The BLSS surveyed about 9000 households in each round, and has rich information on different demographic, economic and social indicators. From this dataset, we collected a number of variables that indicates access to different basic services.⁵ The Central Bureau of Statistics of Nepal conducted the Nepal Living Standards Survey (NLSS). The 2003/2004 round of NLSS surveyed about 3400 households across Nepal, while the 2010/2011 round collected data on about 7000 households.

From each round of the BLSS and NLSS, we collect information about the level of access of different basic services needed by children (0–16 years of age). We use the following five services: (1) access to feeder or tarred roads, or a bus station; (2)

⁵ The full explanation of how each variable has been calculated is presented in Table 5.

access to school; (3) access to electricity; (4) access to clean water; (5) access to a hospital.⁶

Individually, each of these services are important for the growth of a child. Access to school ensures that the child can get to a school that is relatively close to their place of residence. Access to hospital ensures that the children can reach the hospital relatively easily if there is a medical emergency. Access to electricity allows the child to study late at night and not burn air-polluting fuels for light. Access to clean water ensures that the child doesn't get water-borne diseases, and access to proper roads provides a child increased mobility around the region and country. However, if access to one of these services is missing, it can disrupt the proper growth and development of a child. Collectively, these services allow the child to grow up in a socially-nurturing environment that can enhance their educational and health outcomes.

The second aspect we need to take into account are the socio-economic circumstances on the basis of which we do not believe that the children should have differential access. The circumstances that we use are: (1) urban/rural location of the household; (2) sex of head of household; (3) education level of the head of the household; (4) whether the household has a female child; (5) whether the household has a male child; (6) whether the household has a child between ages 0 to 6; (7) whether the household has a child between ages 7–16; and (8) the district where the household is located.

3.2 Results: Bhutan

Table 1 shows the HOI of each service separately for the years 2003, 2007 and 2012. This is the dash-board that is most commonly reported in HOI analyses. Our results show that the coverage rate or mean access to the service has been increasing between 2003 and 2012, although road and school access dipped between 2003 and 2007 before rising again between 2007 and 2012. We find that overall, Bhutanese children in 2012 has more opportunity to access basic services than in 2007 and 2003, as evidenced by the higher HOI values of each service in 2012 when compared to those in 2007 or 2003 respectively.

However, the HOI values in Table 1 fail to show how many households in Bhutan have access to all, or most of basic services provided to them. In the first step, we calculate the index of multidimensional access using intersection approach. If a household has access to all five dimensions, then they get a value of one as their multidimensional access; otherwise they get a value of zero. Table 2 shows the MHOI values of Bhutan. The results show that coverage decreased between 2003 and 2007, before increasing between 2007 and 2012. Although 80 percent of the households in Bhutan had access to each of the dimensions (as seen in Table 1), only about 64 percent households in Bhutan had access to all the five dimensions in 2012, showing that a number of households in Bhutan do not have access to all the variables (see Table 2). We find that the MHOI in Bhutan decreased marginally between 2003 and 2007, before rising substantially between 2007 and 2012.

Table 2 provides a clear picture on the level of access of the basic services by households in Bhutan. About 37 percent of the households do not have access to all the basic services in 2012 (the number was almost 50 percent in 2007 and 43 percent in 2003). This implies that there are households in Bhutan that lack access to all the basic services needed for a proper development of a child. This is important because providing each service piecemeal may not yield the most benefit from that service. If the aim of the

⁶ See the Table 5 for the specific definitions of each service.

Table 1 HOI of each service for the years 2003, 2007 and 2012 of Bhutan

Services	2003		2007		2012	
	Coverage	HOI	Coverage	HOI	Coverage	HOI
Road access	86.626 (1.044)	77.787 (1.714)	83.747 (0.698)	77.489 (0.970)	87.140 (0.651)	82.140 (0.954)
School access	80.465 (1.131)	68.272 (1.804)	68.231 (0.764)	56.210 (0.938)	83.543 (0.709)	78.534 (0.970)
Electricity access	75.527 (1.154)	60.078 (1.877)	85.404 (0.564)	77.042 (0.844)	94.759 (0.453)	92.499 (0.686)
Water access	85.746 (1.162)	79.136 (1.803)	91.619 (0.539)	87.948 (0.776)	94.408 (0.466)	92.193 (0.688)
Hospital access	76.640 (1.358)	66.424 (2.082)	78.584 (0.760)	71.045 (1.002)	81.863 (0.793)	76.683 (1.020)

Based on author's calculations using the BLSS and NLSS data. Standard errors in parenthesis

Table 2 MHOI using the intersection approach

	Bhutan			Nepal	
	2003	2007	2012	2004	2011
Coverage (C)	57.014 (0.942)	48.476 (0.848)	63.791 (0.857)	24.736 (0.697)	50.072 (0.626)
MHOI	39.251 (1.071)	35.625 (0.943)	55.373 (1.081)	14.471 (0.635)	37.394 (0.637)

Based on author's calculations using the BLSS and NLSS data. The intersection approach implies that a child is considered to have access if she has all services provided. Standard errors in parenthesis

government is the proper development of the child, then it should ensure that all the basic services are provided to the child to the fullest extent.

A further point to note is the difference between coverage and the MHOI. This difference shows the extent of inequality in access and the "penalty" is close to eight points in coverage for 2012. However, it is also true that the "penalty" has reduced between 2003 and 2012.

3.3 Results: Nepal

Table 3 shows the HOI measure of Nepal for the years 2003 and 2011. We use the Nepal Living Standards Survey to obtain the results. Table 3 shows that for the most part, HOI of each service has increased between 2003 and 2011. For example, electricity access has increased by about 25 percentage points, and road access has increased by about 10 percentage points.

We now look at MHOI to see what proportion of households in Nepal has access to all these five services collectively. The results are tabulated in Table 2. Between 2003 and 2011 the proportion of households with access to all five services has doubled. However, the coverage is only 50 percent in 2011. The MHOI has risen from 14.5 to 37.4 between 2003 and

Table 3 HOI of each service in Nepal for the years 2003 and 2011

	2003		2011	
	Coverage	HOI	Coverage	HOI
Road access	71.593 (0.530)	55.792 (0.722)	82.819 (0.399)	72.260 (0.620)
School access	92.161 (0.463)	87.734 (0.717)	95.488 (0.294)	92.980 (0.459)
Electricity access	34.638 (0.750)	22.017 (0.774)	68.745 (0.575)	57.335 (0.686)
Water access	82.799 (0.647)	75.714 (0.898)	80.402 (0.514)	72.367 (0.711)
Hospital access	62.475 (0.796)	50.337 (0.982)	73.738 (0.545)	62.738 (0.724)

Based on author's calculations using the BLSS and NLSS data. Standard errors in parenthesis

2011 and the “penalty” has fallen, which implies that there has been a more balanced access to services across all the districts in Nepal in 2011, compared to 2003 (see Table 2).

3.4 Comparing MHOI for Bhutan and Nepal

In 2003 Nepal had a much lower level of MHOI than Bhutan, with only 25 percent of Nepali households having access to all five services, as opposed to 57 percent in Bhutan. The value of MHOI of Bhutan in 2003 was almost 3 times that of Nepal in 2003. However, by 2011, Nepal has improved its MHOI index at a faster rate than Bhutan. Now, about 50 percent of the population in Nepal has access to all five services in 2011, as opposed to 64 percent in Bhutan. The difference in MHOI is also much lower, the Nepali MHOI in 2011 is about 37, compared to 55 in Bhutan in 2012. Although the MHOI is lower in Nepal, the country has made some great strides in raising the availability of services to its citizens. If this trajectory is continued, Nepal will be close to closing the large MHOI gap it had with Bhutan in 2003.

The penalty has reduced for Bhutan but has increased marginally for Nepal. This implies that although Nepal is making progress in providing access to the bundle of services, it is still not reaching the underprivileged groups.

The MHOI provides a clear way to compare the level of access of a bundle of services needed for the proper growth and development of a child across countries. Instead of looking at each service of each country and comparing them in a cross-country framework, the MHOI creates one simple index that can be easily used by policymakers to look at improvements of access to services across time and between countries.

3.5 Robustness

We have until now focused on access to a bundle implying access to *all* services. However, this may prove to be very stringent. In this section we relax this assumption. We define access to mean having at least one of the services available to the household (union approach), or at least two of the services available to the household, and so on.

Our results show that using the union approach we have almost universal coverage and so this is not able to provide any useful information. Using the intermediate cutoffs of two, three and four does provide useful insights though it is not as stringent as the intersection approach (see Table 4).

Table 4 MHOI of Bhutan and Nepal using different cut-off values (k)

Value of K	Bhutan		2007		2012		Nepal		2011	
	Coverage	MHOI	Coverage	MHOI	Coverage	MHOI	Coverage	MHOI	Coverage	MHOI
	1	98.953 (0.412)	98.032 (0.776)	99.199 (0.176)	98.539 (0.322)	99.817 (0.071)	99.639 (0.139)	97.918 (0.242)	96.254 (0.436)	98.631 (0.159)
2	93.256 (1.018)	88.227 (1.726)	95.141 (0.396)	92.032 (0.651)	98.608 (0.250)	97.654 (0.430)	90.351 (0.451)	84.040 (0.743)	94.507 (0.296)	90.732 (0.496)
3	82.269 (1.214)	70.444 (1.997)	88.332 (0.575)	82.103 (0.871)	94.185 (0.481)	91.354 (0.752)	74.014 (0.634)	61.135 (0.844)	84.901 (0.402)	75.618 (0.632)
4	73.511 (1.022)	56.886 (1.638)	76.465 (0.729)	66.723 (0.970)	85.312 (0.675)	79.506 (0.988)	56.648 (0.743)	41.770 (0.849)	73.081 (0.490)	60.137 (0.659)

Standard errors in parenthesis

4 Conclusion

Besides income, access to certain basic services are important for the proper development and growth of a child. Thus, proper assessment is required to see if the poor are able to access all the basic services. If the aim of the government is to provide the best possible environment for a child to grow, then it should focus on providing a bundle of basic services to the child, instead of just one or two. In this paper, we introduce a method of evaluating the level of access of a bundle of basic services that are deemed essential for households in a country. We extend the Human Opportunity Index by incorporating the multidimensional framework of measuring access to a bundle of basic services to show how policymakers can evaluate the level of access across households in a region or country. Using this approach we create the MHOI.

We use data from Bhutan and Nepal to illustrate our index. We focus on showing how much access children across Bhutan and Nepal (with certain measurable characteristics) have for a bundle of basic services that are essential for the healthy growth and development of a child. We select five such basic services and though all children have access to at least one of the services, there are fewer with access to all five of them. Less than two thirds of children have access to all five basic services in those three rounds of data of Bhutan. In Nepal, about 50 percent of the households do not have access to all five services in 2011. The Bhutanese government has made progress in increasing MHOI across the years, rising from 39 in 2003 to 55 in 2012; while Nepal achieved a dramatic increase of MHOI from 14 to 37 between the years 2003 and 2011. However, there is still a need to increase MHOI of these two nations further so that children of all households have the same amount of access to a bundle of basic services to ensure their proper growth and development.

Appendix

See Table 5.

Table 5 Service list and definitions

Service	Definition
Access to feeder or tarred roads, or a bus station	If the household is close to such roads
Access to school	If the school is within 45 min from the house using any mode of transportation
Access to electricity	Whether the household has electricity connection and uses it as a primary source of lighting
Access to clean water	Whether the household has access to clean water that is close to the household
Access to a hospital	If the household has a hospital that is close by

For each given dimension, the household gets a value of one if there is access to that dimension of well-being and the household can obtain the services of that dimension relatively easily. For more information about how we calculate access to each of the five basic service, please see our working paper. For the purposes of consistency across years and across countries, we try to keep the definition of access to each basic service the same between Nepal and Bhutan so that the MHOI between these two countries can be compared

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