How Unequal is Access to Opportunity in Cambodia?

Introduction

In this article, we measure inequality of opportunity in Cambodia to access basic healthcare, education and infrastructure services. The focus here is also to determine key circumstances contributing to existing inequalities. Previous studies on inequality in Cambodia have tended to end up on one side, fixing on equality of outcome. And true enough, inequality of opportunity does have calculated effects on outcomes to which all segments of the population should claim access. But the quest for inclusive development impels us to look beyond mere analysis of outcomes, and to take a closer look at equality of opportunity.

Inequality in access to basic services and facilities could be caused by differences in effort or talent, or by the different opportunities available to individuals. Inequality due to differences in effort and talent is hard to address, if not impossible. Those with great talent or doing things with great effort seem to achieve or benefit more from services than those without talent or making mediocre effort. In most societies, there are broadly shared beliefs that such inequality is acceptable, i.e. it is deemed "fair" in that people who work hard are well rewarded.

In contrast, the existence of unequal opportunities for access to services is considered "unfair" or socially unacceptable and should therefore be redressed. Imagine a child born into a poor household in a less developed region; that child might lack access to basic education because there is no school nearby or because the family is too poor to afford education. It is not talent or effort that matters, but the opportunity. Those circumstances are beyond the child's control and should not decide whether he or she has access to education. The policy goal is to reduce inequality of opportunity so that all segments of the population have equal access to basic services such as education, healthcare and infrastructure.

This article first describes the approach to computing the Human Opportunity Index, and then presents the empirical results of a household survey along with a discussion of the key findings. The final section concludes.

Human Opportunity Index

Inequalities in access to healthcare, education and basic infrastructure are measured by using the Human Opportunity Index (HOI), originally proposed by Paes de Barros et al. (2009). The HOI is a composite index consisting of two components: (i) the average coverage of the relevant service or facility (such as healthcare or education), and (ii) the distribution of the access to that service or facility across variables such as income group, geographic location and gender.

The higher the HOI score, the lower the gap in opportunity to access a particular service or facility. That said, the HOI value could be higher either because of higher average coverage of that service or facility and/or because access to that service or facility is more equally distributed among households across income groups, regions within the country, or between males and females. Take the case of the HOI for safe drinking water across rural and urban areas. The HOI could be higher if the average percentage of the country's population with access to safe drinking water is higher, also if the access to safe drinking water is more equally distributed across urban and rural areas. Similar interpretations could be made about the HOI for safe drinking water across income groups or gender.

Thus, the HOI for a particular service or facility can be seen as the overall availability of that service or facility in the country adjusted for the inequality in the distribution of the access to that service across income groups, regions and gender. The HOI then is the product of two components: the coverage rate (C), and inequality in its distribution (D). Here, the HOI can be written as:

$$HOI = C(1-D),$$

Table 1: Inequality of Opportunity in Access to Education

	Net attendance rate (%)						On-time completion rate (%)					
	Primary grade 1–6		Lower secondary grade 7–9		Upper secondary grade 10–12		Primary grade 6		Lower secondary: grade 9		Upper secondary: grade 12	
	2009	2011	2009	2011	2009	2011	2009	2011	2009	2011	2009	2011
Coverage	83.6	85.4	36.6	34.8	21.4	24.9	47.4	56.4	50.0	48.8	24.1	32.3
D-index	1.9	1.4	13.1	15.2	21.5	25.6	10.8	12.5	9.1	17.1	22.1	22.1
HOI	82.0	84.2	31.8	29.5	16.7	18.5	42.3	49.3	45.4	40.4	18.7	25.1
N	8264	2119	4061	999	4217	1083	1218	339	805	206	467	175

Source: Authors' calculations using CSES 2009, 2011

where the value of D ranges from zero to one and hence HOI is always equal to or less than C.

A higher D means that access to the particular service or facility is more unequally distributed. It is easy to see that the HOI can be increased by either improving the overall availability of a particular service or facility (the coverage rate C), or reducing the inequality in the distribution of the access to that service or facility (the distribution index D, often referred to as the dissimilarity index) or both. If existing opportunities are distributed equally, D is closer to zero and the HOI is closer to the coverage rate, C. If, on the other hand, existing opportunities are highly unequally distributed, D is closer to one and HOI will be much lower than C (see the Appendix for details of how to calculate C, D and HOI).

Empirical Results and Discussion

This study required a full household survey dataset so that we had sufficient data on the selected circumstance variables. They include gender of individual; age, gender and education level of household head; area of residence (urban or rural); household size; and household per capita consumption. We also used data from the Cambodia Socio-Economic Survey (CSES) 2009 and 2011.

Education

Net attendance and on-time completion rates are the two variables used to assess access to basic education. Net attendance rate is defined as the percentage of children in the age group that officially corresponds to primary/secondary schooling who attend primary/secondary school. On-time completion rate is the

Table 2: Contribution of Circumstance Variables to Inequality of Access to Education (%) – Net Attendance Rate

Decomposition (%)	Primary grade 1–6		Lower secondary grade 7–9		Upper secondary grade 10–12	
	2009	2011	2009	2011	2009	2011
Gender of individual	8.5***	35.1***	4.6***	5.4***	0.6***	2.4***
Gender of household head	17.0***	3.5***	0.5***	2.2***	0.3***	3.0***
Area of residence (urban/rural)	13.2***	46.4***	31.9***	19.5***	65.0***	36.9***
Household size	1.4	1.8***	13.9***	10.1***	8.7***	3.0***
Consumption per capita	21.8***	8.6***	39.4***	31.6***	18.8***	10.1***
Education level of household head	5.2***	2.6***	5.0***	30.3***	4.0***	42.9***
Age of household head	32.8***	2.0***	4.7***	0.8***	2.6***	1.8***

Note: Logistic regression coefficient statistically significant at ***1%, **5% and *10%.
Source: Authors' calculations using CSES 2009, 2011

Table 3: Contribution of Circumstance Variables to Inequality of Access to Education (%) – Completion on Time

Decomposition (%)	Primary grade 6		Lower secondary grade 9		Upper secondary grade 12	
	2009	2011	2009	2011	2009	2011
Gender of individual	21.3***	6.9	19.8***	22.1**	2.0***	18.8*
Gender of household head	1.6***	0.8	1.1***	10.7*	0.3***	19.3***
Area of residence (urban/rural)	20.4***	15.1	33.0***	18.5**	49.3***	20.9
Household size	10.8***	3.6	5.2***	7.0**	6.1***	8.1
Consumption per capita	16.8***	21.6	31.4***	4.4	6.1	15.3
Education level of household head	18.0***	41.9***	2.2***	30.6***	19.3***	15.5**
Age of household head	11.2***	10.1	7.3***	6.6	17.1***	2.1

Note: Logistic regression coefficient statistically significant at ***1%, **5% and *10%.
Source: Authors' calculations using CSES 2009, 2011

percentage of children in the age group entering the last grade of primary/secondary education. We categorise education into three levels—primary, lower secondary and upper secondary.

As illustrated in Table 1, for primary education, the average opportunity to attend school marginally improved to 85 percent in 2011 from 84 percent in 2009. The D-index also dropped from around 2 to 1 percent in the same period, indicating improved distribution of the available service without discriminating against individual circumstance variables. Increased average access and improved distribution resulted in a high HOI of 84 percent in 2011, up from 82 percent in 2009.

The overall trend is similar for lower and upper secondary education; yet, a few observations should be pointed out. First, average opportunity tended to be lower at the higher level. Access to lower and upper secondary averaged 36 and 23 percent, respectively, during 2009–11. Secondly, the D-index was also trending upwards signifying possible discrimination against certain groups particularly the worse-off. Lastly, the decrease

in access rate and increase in dissimilarity index resulted in a low HOI.

Another education indicator is on-time completion rate at sixth, ninth and twelfth grades. The results in Table 1 show that children performed relatively better at sixth grade, with a completion rate of 56 percent in 2011. The D-index was also low at 12 percent in the same year. However, access and distribution become an issue at higher grades, specifically at grade twelve. The on-time completion rate was only 32 percent in 2011 with a D-index of 22 percent.

Tables 2 and 3 present the contribution of each circumstance variable to overall inequality of opportunity. For lower secondary education in 2011, area of residence explains 19 percent of the inequality of opportunity compared to per capita household consumption (32 percent) and education level of household head (30 percent). In the same year and relative to other variables, the three factors remained significant at upper secondary level. Where a child was born contributes 37 percent compared to household consumption at 10 percent. Education of

Table 4: Inequality of Opportunity in Access to Health (%)

	Vaccination		Antenatal care		Delivery in public hospital	
	2009	2011	2009	2011	2009	2011
Coverage	94.3	98.7	85.0	92.2	41.5	69.6
D-index	1.2	0.4	2.9	1.1	9.8	2.1
HOI	93.2	98.2	82.4	91.1	37.6	68.1
N	12443	16327	23437	16327	23437	16327

Source: Authors' calculations using CSES 2009, 2011

Table 5: Contribution of Circumstance Variables to Inequality of Access to Health (%)

Decomposition (%)	Vaccination		Antenatal care		Delivery in public hospital	
	2009	2011	2009	2011	2009	2011
Gender of individual	4.6***	21.7***	–	–	–	–
Gender of household head	19.6***	15.2	3.3***	12.4***	1.7***	2.6***
Area of residence (urban/rural)	44.2***	16.0***	40.1***	22.5***	69.5***	52.7***
Household size	2.5***	9.0***	1.7***	21.9***	2.3***	1.9***
Consumption per capita	13.1***	11.5***	37.1***	32.3***	10.7***	13.5***
Education level of household head	3.8***	25.2***	3.3***	7.2***	5.5***	14.2***
Age of household head	12.3***	1.3***	14.6***	3.6***	10.3***	15.0***

Note: Logistic regression coefficient statistically significant at *** 1%, **5% and *10%.
Source: Authors' calculations using CSES 2009, 2011

household head seems to be significant in explaining the probability of a child accessing upper secondary education. The results on the contribution for the on-time completion rate depict similar trends.

Health

We chose three variables to measure access to basic healthcare: vaccination, antenatal care and delivery in public hospital. Vaccination (rate) is the percentage of children between 0–23 months old that receive a vaccination. Antenatal care refers to the percentage of women who seek antenatal care during pregnancy, and delivery in public hospital refers to the percentage of women who give birth in public health centres.

Both the coverage and distribution of access to vaccination, antenatal care and delivery in public hospital improved between 2009 and 2011 resulting in high HOI scores. Table 4 presents the evidence. Access to vaccination, for instance, was near universal reaching 99 percent coverage in 2011 and almost evenly distributed (D-index equals 1 percent).

The percentage of pregnant women who received regular antenatal care was also high at 92 percent in 2011 and depicts an almost uniform distribution. Nonetheless, the percentage of women who gave birth in public health centres was relatively low, but improving, at 70 percent in the same year.

The decomposition results reveal some interesting observations (Table 5). On access to vaccination, there is no single circumstance variable dominating the probability of access even though gender of children and education level of household head seem to be relatively significant in 2011. Descriptive statistics also support the finding that there is no significant difference in access to vaccination among children across consumption quintiles, region and gender (results not shown).

However, area of residence and per capita household consumption were the main contributors to the probability of women seeking antenatal care during their pregnancy. For instance, only 79 percent of pregnant women residing in rural areas sought antenatal care compared to 96 percent of women in

Table 6: Inequality of Opportunity in Access to Basic Infrastructure (%)

	Access to electricity		Access to safe water		Access to sanitation	
	2009	2011	2009	2011	2009	2011
Coverage	29.5	41.8	45.5	48.2	43.4	50.8
D-index	45.0	30.0	15.5	16.4	26.6	23.3
HOI	16.2	29.3	38.4	40.2	31.8	38.9
N	11971	3592	11971	3592	11971	3592

Source: Authors' calculations using CSES 2009, 2011

Table 7: Contribution of Circumstance Variables to Inequality of Access to Basic Infrastructure (%)

Decomposition (%)	Access to electricity		Access to safe water		Access to sanitation	
	2009	2011	2009	2011	2009	2011
Gender of household head	1.9	1.2	4.6**	4.3***	0.9	1.6*
Area of residence (urban/rural)	69.6***	51.8***	63.0***	62.9***	48.6***	35.2***
Household size	1.2***	1.2***	0.8	1.8	2.8***	3.2***
Consumption per capita	22.0***	27.8***	23.5***	13.4	36.8***	37.6***
Education level of household head	1.6**	13.1***	3.9***	15.7***	1.7	12.2***
Age of household head	3.7**	5.0***	4.2	1.9	9.1***	10.2***

Note: Logistic regression statistically significant at ***1%, **5% and *10%.
Source: Authors' calculations using CSES 2009, 2011

Phnom Penh and 94 percent in other urban areas (results not shown). Area of residence, per capita household consumption and age of household head were the main contributors to the probability of women giving birth in public hospital.

Basic Infrastructure

Access to infrastructure such as electricity, safe water and sanitation—all basic human services—is the foundation for health and well-being. Access to electricity is defined as the percentage of households having access to public electricity supplies, access to safe water is the percentage of households having access to safe water sources,[1] and access to sanitation is the percentage of households having proper toilets within their premises.[2]

As presented in Table 6, access to infrastructure improved between 2009 and 2011, evident by the improved coverage rates. Compared to others, access to electricity increased considerably from around 30 percent in 2009 to 42 percent in 2011. However, this coverage is very low compared with other countries in the region. Worse still, despite the improved trend, the inequality of access to electricity is very high (30 percent), resulting in a low HOI (29 percent). Access to safe water, with a D-index of 16 percent in 2011, shows better distribution than the other two variables.

Regional differences, shown in Table 7, explain much of the differing access to basic infrastructure,

followed by per capita consumption, a proxy of economic wellbeing. Descriptive statistics also confirm this finding. In 2011, for example, 98 percent households in the capital city Phnom Penh had access to power, compared to only 24 percent in rural areas. No doubt, the inequality is high as shown by the D-index.

Conclusion

Using Cambodia Socio-Economic Survey data for 2009 and 2011 to compute the Human Opportunity Index, this article provides an estimate of the inequality of opportunities in healthcare, education and basic infrastructure in Cambodia. The findings suggest that Cambodia has performed well in primary education but secondary levels have lagged far behind. The average access to primary education is relatively high, while the inequality of access is low. This does not hold true for secondary education, where access is comparatively low and the distribution of that access is markedly uneven.

Access to healthcare has improved considerably over time, and headway in the distribution of opportunities is well documented. However, the country has a very poor record of providing basic infrastructure, i.e. access to electricity, safe water and sanitation. Despite progress, the coverage of those services is still low compared to the rest of the region. Worse, inequalities in providing accessibility are also large, suggesting high concentration of coverage among particular segments of the population. While a policy tool should target both issues of coverage and distribution, addressing the former should be a priority given the extent of the coverage problem compared to the distribution.

We further argue that regional differences explain much of the overall inequality in access to

---

[1] Including piped water in dwelling or on premises, public tap tubewell/borehole, protected dug well or improved rainwater collection.

[2] Includes improved latrines—pour flush connected to sewerage, and pour flush to septic tank or pit; and unimproved latrines— pit latrine with/without slab, and latrine overhanging field or water.

opportunities. While urban areas offer residents very good coverage of key opportunities, rural areas or disadvantaged parts of the country do not. Economic status of households also partly determines whether people can afford a basic level of service where they have to incur costs to get access. Education level of household head, too, accounts for the poor distribution of opportunities provided to acquire healthcare and education. These determinants are not mutually exclusive, however. A policy tool to tame and temper such inequality of opportunities should take into account all those contributing factors. Addressing the economic problem might help to overcome other barriers related to access such as regional differences, or vice versa. This is something policymakers should ponder.

Appendix

The HOI is the product of two components: the coverage rate (C), and the dissimilarity index (D). Here, HOI can be written as:

$$HOI = C(1-D),$$

where $\quad 0 \le D \le 1$ and $HOI \le C$ (1)

Coverage rate (C) can be computed as:

$$C = \sum_{i=1}^{n} w_i p_i ,$$ (2)

where individual/household is $i=1,2,…, n$; w_i is the weight assigned to individual/household i in the survey sample; $p_i=\{0,1\}$, $p_i=1$ means individual/household i has access to the opportunity and 0 otherwise.

The D index is given by:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^{n} w_i |\hat{p}_i - \bar{p}|$$ (3)

where $\hat{p}_i$ is the predicted probability from the logistic regression of the variable of access on a set of circumstance variables, for instance education level of household head, area (urban or rural), or per capita consumption in a household.

It is more interesting for policymakers to see the contribution of different circumstances to overall inequality of opportunity by using the decomposition method proposed by Hoyos and Narayan (2011). The approach can also be found in Vega et al. (2010) and

Son (2012). The logistic model of the probability of access to an opportunity is given by:

$$\ln(\hat{y}_i) = \sum_{j=1}^{m} \hat{\beta}_j X_{ij} ,$$ (4)

where X_{ij} is vector of circumstance variables, and $\hat{\beta}_j$ is a vector of coefficient estimates from the logistic model using maximum likelihood estimation method. The decomposition of inequality in opportunity can be derived by taking variance of both sides in equation (4) (see Field 2003; Son 2012) to get:

$$\sigma^2 \ln(\hat{y}_i) = \sum_{1}^{m} \hat{\beta}_j \mathrm{cov}(X_{ij}, \ln(\hat{y}_i))$$

$$S_j = \frac{100 \times \hat{\beta}_j \mathrm{cov}(X_{ij}, \ln(\hat{y}_i))}{\sigma^2 \ln(\hat{y}_i)}$$ (5)

where S_j is the percentage contribution of jth circumstance variable to the total inequality of opportunity.

References

Paes de Barros, Ricardo, Francisco H.G. Ferreira, Jose, R. Molinas Vega and Jaime Saavedra Chanduvi (2009), "Measuring Inequality of Opportunities in Latin America and the Caribbean" (Washington, DC: World Bank)

Fields, S. Gary (2002), "Accounting for Income Inequality and its Change: A New Method, With Application to the Distribution of Earnings in the United States, http://digitalcommons.ilr.cornell.edu/articles/265/ (accessed 23 May 2014)

Hoyos, Alejandro and Ambar Narayan (2011), "Inequality of Opportunities among Children: How Much Does Gender Matter?" Background paper for the World Development Report 2012

Son, Hyun Hwa (2012), *Inequality of Human Opportunities in Developing Asia,* Asian Development Bank Economics Working Paper Series No.328 (Manila: ADB)

Vega, Jose Molinas, Ricardo Paes de Barros, Jaime Saavedra Chanduvi, Marcelo Giugale with Louise J. Cord, Carola Pessino and Amer Hasan (2010), "Do Our Children Have a Chance? The 2010 Human Opportunity Report for Latin America and the Caribbean", Conference Edition (Washington, DC: World Bank)