

Human Opportunities in the Kyrgyz Republic



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The idea that the circumstances one is born into and has no control over should have no influence on his or her life chances, or opportunities is a powerful one. Yet it is often found that an individual's immutable attributes such as gender, race, ethnicity or parents' socio-economic status are important factors in deciding whether or not the individual has access to some of these basic opportunities. This has important implications for the persistence of inequality and the degree of overall economic mobility in any society – be it over the lifecycle or across generations. This report analyzes the state of human opportunities among children in the Kyrgyz Republic. We use data from the 2010 round of Kyrgyz Integrated Household Survey (KIHS), together with data from a Multi-cluster Indicator Survey (2005/06) and test score data from the 2009 Program for International Student Assessment (PISA) to take stock of degree of inequality of opportunity in the access to education, health, infrastructure and housing amenities. The analysis is first of its kind for the country and not only enriches the existing diagnostic work on poverty but also provides newer avenues for engagement with the government policymakers.

EXECUTIVE SUMMARY

The Kyrgyz Republic has made some progress in improving its poverty and social indicators but the gains have been fragile and significant disparities remain within the country. The slowdown in economic growth in 2009 and the resulting uptick in poverty underscored the susceptibility of the economy to external shocks. At the same time, a number of structural factors – e.g., the lack of connectivity of certain oblasts (regions), the historical role of women in the society etc. – continue to perpetuate sharp disparities in access to various economic and social services across the country. These disparities also drive the pattern of inequality of economic outcomes observed in the country.

In this report, we tackle the issue of inequality in the Kyrgyz Republic by framing it along the notion of *equity* as opposed to *equality*. The reason for doing so is that it is easier to galvanize social consensus and policy action when the overarching principle guiding policy is fairness in the allocation and access to opportunities as opposed to equality of outcomes. A girl born in a remote village in the oblast of Naryn to a single, uneducated mother with four other siblings ought to have the same shot at becoming a doctor or an engineer as a boy with one sibling, born in an educated, two-parent household in Bishkek. Her odds should not be shaped before she is even born, never mind before she has made any conscientious choice.

Analyzing such *opportunities* for children in Kyrgyz Republic, therefore, can help policymakers better understand the nature and causes of inequality of *outcomes* that is observed among adults. Opportunities among children can also be reliable predictors of economic mobility across generations and over time. For instance, if access to basic opportunities, in the form of education, basic health and infrastructure during childhood is dependent on circumstances of an individual (such as parental socio-economic status and location of residence), as it appears to be in Kyrgyz Republic, then it reinforces the link between children's circumstances and their overall opportunities in life. This will, in turn, end up perpetuating economic inequality between groups with different circumstances over generations. For policymakers interested in closing gaps in outcomes between certain sub-groups of the population within the country, a comprehensive analysis of these opportunities can provide a useful blueprint on which efforts to level the playing field can be based.

Basic opportunities are defined as subset of goods and services for children, such as access to education, safe water on site, or reliable electricity that are critical in determining opportunities for economic advancement in life. These are either already affordable by society at large or could be in the near future, given the available technology. Universal provision of these basic opportunities is a valid and realistic social goal.

Opportunities among children are measured in this report by the Human Opportunity Index (HOI), which is the coverage rate of a particular basic service adjusted by how equitably the service is distributed among groups differentiated by circumstances. In discounting inequitable access, the HOI reflects how personal circumstances – for which the children cannot be held accountable – affect their basic opportunities. This means that two societies with the same coverage rate for any service can have different HOIs if citizen access to that service in one society is determined to a greater extent by gender,

family background or any other personal circumstance beyond their control and widely accepted by society to be an unjust source of exclusion.

The circumstances that are used in the analysis in this report for the Kyrgyz Republic are as follows: gender of the child, family structure, urban/rural residence, oblast of birth and residence and socio-economic background of the parents. Family structure is a circumstance that captures whether or not both parents live in the household. Parental socio-economic background is proxied by the highest education level of either parent. The reason for using parental education rather than household consumption (the more commonly used indicator for standard of living) is that this information is not available in all three surveys.

The opportunities considered are those that improve a person's ability to expand his or her future production possibility frontier by investing in human capital in the early stages of her life. We focus on three broad categories of opportunities that are critical for an individual, especially during early childhood. The three categories are the following: the opportunity to receive adequate education; the opportunity to receive a healthy start in the first few years of life, and finally; the opportunity to grow up in a household with housing conditions that are sufficient to provide a safe, stable and a stimulating childhood.

The key finding of this report is that the goal of equal opportunity remains distant in the Kyrgyz Republic: a child's circumstances such as her parents' socioeconomic status, region of residence, whether it is urban and rural etc. have a substantial bearing on the extent to which certain services are available to her. Looking at specific opportunities, we find that in education, enrollments are close to universal but there are large gaps when one looks at measures of quality of education such as completion rates and test scores. Children in certain regions and within these regions, children whose parents are in certain socio-economic strata appear to have a lower chance at obtaining a good quality education.

Similarly, opportunities pertaining to a healthy start in life adequate access to household infrastructure and amenities that ensure a stable, safe and stimulating childhood also have strong regional dimensions with entire regions being underserved. The oblast of residence accounts for over 60 percent of the observed inequalities in the health related opportunities analyzed here and roughly the same proportion of the inequality observed in the other infrastructure related opportunities. In addition, the regional distribution of opportunities in the Kyrgyz Republic appears to mirror the distribution of poverty very closely: oblasts with the highest poverty are also the oblasts with the poorest provision of opportunities.

It is widely accepted that opportunities to bolster human capital in childhood are closely related to the kind of opportunities one can access in the labor markets as an adult and opportunities in the labor market are in turn critical for economic mobility over a lifetime as well as across generation. Thus, the implication of the finding on the correlation between poverty and lack of opportunities for the Kyrgyz Republic is that the prospects of economic mobility are lower precisely in the oblasts where one might think they are most needed.

Finally, what this report has done is taken a snapshot of the distribution of opportunities in the Kyrgyz Republic for a particular year. Conditional on data availability, it would be useful to conduct a similar analysis either for another time in the recent past or for another year with similar data. This would facilitate the analysis of trends and inform policymakers not only on whether opportunities have expanded or shrunk but also whether these changes have been driven by changes for the entire population or changes that have come specifically for the relatively underserved. This can then lead back to a discussion on policy. What kind of sectoral policies in education, health, drinking water, and other economic infrastructure can be used to enhance opportunities for all children? Would policies designed at improving the population level access ensure improvement in access for the underserved? Or would the policies need to be catered specifically to the underserved social groups being mindful of the equity dimension?

Introduction

The Kyrgyz Republic is a mountainous, low-income country. The economy is primarily agricultural and around 74.2% of the 5.4 million people reside in rural areas. Per capita GDP in 2010 was US\$ 860 making it one of the poorest countries in the Europe and Central Asia region. The most recent data shows that the country has an absolute poverty rate of 33.7% in 2010.ⁱ This represents a minor increase in poverty from 2009 and is in part attributable to a slowdown in economic growth in 2009 on account of the global economic crisis, and the economic contraction in 2010 precipitated by domestic political turmoil and a combination of other external shocks.ⁱⁱ Overall, the high level of absolute poverty as well as its susceptibility to internal and external shocks suggests a high degree of vulnerability among the poor in the country.

The country has made commendable progress on meeting some of its Millennium Development Goals (MDGs) – the targets for extreme poverty, universal secondary education and environmental sustainability have already been met. However, there have been significant challenges and even reversals in the indicators measuring progress on some other indicators. Particularly, it has been noted that maternal mortality, primary school completion and incidence of tuberculosis and HIV/AIDS are some indicators that have worsened in recent years. Although the Kyrgyz Republic spends a substantial share of its available public resources on education and health, it still lags behind many other former Soviet republics, in per capita terms. This implies that a significant realignment, possible reprioritization, and substantial improvement in the efficiency of public expenditures may be required if the country is to improve its human capital in the long term.

Another critical element of deprivation in the Kyrgyz Republic – irrespective of whether it is manifested as monetary poverty or as deprivations along a myriad of social and economic services such as health, education, drinking water and heating – is the differential performances of the various geographical regions. The incidence of both absolute and extreme poverty is markedly higher in rural areas in comparison to the urban ones. In regional terms, oblasts such as Naryn, Jalal-Abad, Talas and Osh have substantially higher poverty rates than other regions. Similarly, poverty rates are also higher in the mountains in comparison to the plains.

On the one hand this means that geographical disparities are likely to explain a substantial part of the observed inequality in the country. But on the other hand, this is also a reflection of the uneven access to economic opportunities for the individuals within the country. For example, urban areas are likely to have better job opportunities in sectors such as mining, transport and finance which are also the sectors with the highest wages. While there can be a lot of debate and also a lack of agreement on how policy can or should – if at all – be utilized to equalize economic outcomes across regions or between individuals of certain circumstances, there is a often a general consensus that economic opportunities should be provided in an equitable manner. This is particularly true of opportunities related to human capital development as they are critical for economic mobility over a lifetime or across generations in the Kyrgyz Republic.

Inequality, growth and development

Focusing on human capital is important because the link between human capital and economic growth has been well established in the rich cross-country empirical literature. For example, Barro (2001) finds growth to be positively related to the average years of school attainment of adult males at the secondary and higher levels at the beginning of the period, in a panel of 100 countries observed from 1965 to 1995. While “quantity” of schooling is important, quality of schooling as measured by internationally comparable test scores is even more so: Barro (2001) finds scores on science tests to have a particularly strong positive relationship with growth. A number of studies in recent years have shown the effect of health on economic growth to be important (see Grimm, 2011 for an overview).ⁱⁱⁱ

Recent literature has also assessed the effect of *inequality* in education and health on economic growth. Molina et al (2012) find that countries with lower inequality in education grow faster. Similar finding has been reported for health as well. Grimm (2011) uses a cross-national panel data set of 62 low and middle-income countries between 1985 and 2007 and finds a “substantial and relatively robust negative effect of health inequality on income levels and income growth”.

The effect of *inequality* in general, of, say income, on development has been studied along two main strands. The first strand has examined the relationship between inequality and economic mobility. The evidence suggests that inequality hurts economic mobility, particularly across generations, i.e., countries with higher inequality as measured by the Gini coefficient are found to have a lower measure of mobility across generations. The second and perhaps the more prominent line of research is the study of the direct effect of inequality on growth. The body of evidence generated on this however is generally mixed. Some studies have found wider income gaps to be associated with slower growth while others have found exactly the opposite. Summarizing this literature, the verdict that Banerjee and Duflo (2003) come to is that the evidence is generally inconclusive.

More recently, however, this literature is undergoing a modest revival with *inequality* being replaced by *inequality of opportunity* as the key variable of interest. The notion driving this line of enquiry is that the component of inequality that originates from the role of pre-determined circumstances such as gender, ethnicity, birth-place or parental wealth in determining people’s economic, social and political success is (a) different from the inequality arises out of differential effort, life choices or innate talent and, (b) thus should have a different effect on growth in comparison to the latter.

While research establishing a causal link between this *inequality of opportunity* - which is also the type of inequality addressed in this report – and growth at the macro level is still at a nascent stage, the evidence so far seems to favor the hypothesis that inequality of opportunity has an adverse impact on growth and development. In a historical data set of nearly 100 countries, Molina et al. (2012) finds that inequality of opportunity – attributable to circumstances an individual is born into – in education among children has a negative impact on per capita income. Similarly, Marrero and Rodriguez (2010), using data from states in the United States, finds a negative relationship between the component of income inequality attributable to circumstances and economic growth. Finally, Narayan et al (2012) also find a

composite measure of inequality of opportunity across a broad range of opportunities to be negatively correlated with per capita GDP for twenty countries in sub-Saharan Africa.^{iv}

Inequality of what?

There is another reason for focusing on the inequality of opportunity as opposed to the inequality of outcome. From the point of view of policy, high inequality predictably polarizes political and economic debate in any country. While the perils of an unequal society are universally acknowledged, the notion of the unfairness requiring active policy intervention rarely finds consensus. In particular, some argue, and with justification, that individuals cannot and indeed should not be rewarded equally irrespective of their effort, choices in life (whether or not to pursue higher education, for example) or innate talent. If a person works harder than another, it is only fair that she gets suitably compensated; the same for someone who happens to be more talented than another.

However, there is much broader agreement on the notion that pre-determined circumstances such as gender, ethnicity, place of birth or family origins should not play a role in determining people's economic, social and political success. In other words, a person should not have fewer opportunities in life just because she is a girl or just because she is born of a certain color. This is the core principle behind the concept of equality of opportunity and it is also the framework adopted in this report for the Kyrgyz Republic.^v

Political and social consensus and policy action therefore becomes much more likely when the sources of inequality are decomposed such and the issue is framed around the notion of *equity* rather than *equality*. A girl born in a remote village in the oblast of Naryn to a single, uneducated mother with four other siblings ought to have roughly the same shot at becoming a doctor or an engineer as a boy with one sibling, born in an educated, two-parent household in Bishkek. Her odds should not be shaped before she is even born, never mind before she has made any conscientious choice. There is little political divide on this, including in the Kyrgyz republic.

What would it take to equalize the chances for these two individuals to succeed in life? There is ample research that shows that access to a basic set of goods and services during childhood can be an important predictor of future outcomes including educational achievements and earnings. Access to quality basic services such as education, healthcare, essential infrastructure (like water, sanitation and electricity) provides an individual, irrespective of her background, the *opportunity* to advance and reach her human potential.

Analyzing such *opportunities* for children in the Kyrgyz Republic, therefore, can help policymakers better understand the nature and causes of inequality of *outcomes* that is observed among adults. Opportunities among children can also be reliable predictors of economic mobility across generations and over time. For policymakers interested in closing gaps in outcomes between certain sub-groups of

the population within the country, a comprehensive analysis of these opportunities can provide a useful blueprint on which efforts to level the playing field can be based.

Framing the debate in such terms had not been possible until recently because of the lack of an intuitive measure of equality of opportunity among children (something akin to the Gini) that could be readily

Box 1: Equality of Opportunity

While social scientists and philosophers before the 1970s dealt mostly with the fairness of outcomes, a number of authors have since delved into issues of fairness of process, equality of resources and equality of opportunity for welfare. Sen (1979, 2001) has been deeply influential in arguing for an equitable distribution of “capabilities,” which essentially amount to a person’s ability and effort to convert resources into outcomes they have reason to enjoy. Roemer (1998) formalized an equality of opportunity principle, arguing that opportunities should be independent of circumstances and outcomes should depend only on effort and innate ability. Most agree that policy should work to ensure this independence. How does the concept of equality of opportunity translate to measurable objectives for countries? While defining and measuring “opportunities” can be subjective and contextual, most societies can agree on a basic set of goods and services, such as safe water, adequate sanitation, nutrition and primary schooling, which conform to a minimalist notion of “opportunities” for citizens, and most societies can agree that equality of opportunities should be a goal to aspire towards when opportunities are defined in terms of access to minimal set of basic goods.

The World Bank’s focus on equity is well articulated in the 2006 World Development Report, *Equity and Development*. The report argues that inequality of opportunity sustains extreme deprivation, results in wasted human potential and weakens prospects for overall prosperity. Regardless of the choice a society makes about how to universalize opportunities, there is a need for systematic ways for a country to measure its progress towards providing opportunities to all its citizens, beyond commonly used measures of overall coverage of goods or services. This empirical work for the Kyrgyz Republic addresses this need.

applied to the type of data typically available in a developing country. Development of techniques such as the Human Opportunity Index (HOI) at the World Bank in partnership with others, and their application in the Latin America and Caribbean region in the last decade has helped fill some of that gap (see Box 1 for background). This report purports to apply some of these techniques to better understand the underpinnings of inequality of opportunity in the Kyrgyz Republic.

In this analysis of opportunities, we focus exclusively on opportunities that are provided to an individual in childhood. For a child, opportunities are synonymous with access to (and utilization of) basic goods or services, such as basic education, health, safe water and sanitation, while “individual effort” is mostly irrelevant, because the family, society, or the government (and not the child herself) are responsible for ensuring whether or not she will have access to them. The focus on children also has impactful implications for public policy. Academic research has found interventions that equalize opportunities earlier in life to be significantly more cost-effective and successful than those attempted later in life.^{vi}

Key Questions

This report poses two key questions with regard to equality of opportunities among children in the Kyrgyz Republic:

1. **What is the status of children's access to basic opportunities** (education, health, water, sanitation and so on) in terms of coverage and distribution among children of different circumstances? Are the Kyrgyz children provided opportunities that allow them to build a dignified and productive life of their choosing? Or, do circumstances that they have no control over such as gender, parents' socioeconomic status, family structure, and the place where one is born and grows up determine access to basic services?
2. **What are the circumstances that shape the inequality of opportunity in the Kyrgyz Republic,** and consequently what are the profiles of the most vulnerable groups among Kyrgyz children? Going forward, what is the most efficient way to expand the provision of basic services to best improve equality of opportunity in the Kyrgyz Republic?

To provide a comprehensive assessment of opportunities available to children we use data from the 2010 round of Kyrgyz Integrated Household Survey (KIHS), together with data from a Multicenter Indicator Survey (2005/06) and test score data from Program for International Student Assessment (PISA) to take stock of degree of inequality of opportunity in the access to education, health, infrastructure and housing amenities among children in the Kyrgyz Republic.

Opportunities among children are measured in this report by the Human Opportunity Index (HOI), which is the coverage rate of a particular basic service adjusted by how equitably the service is distributed among groups differentiated by *circumstances*. In discounting inequitable access, the HOI reflects the extent to which personal circumstances for which a child cannot be held accountable affect her basic opportunities. This means that two societies with the same coverage rate for any service can have different HOIs if citizens' access to that opportunity in one is determined to a greater extent by their gender, race family background or any other personal circumstance that is beyond their control and considered by society to be an unjust source of exclusion.^{vii} (See Box 2)

Box 2: The Human Opportunity Index – An Introduction to the Methodology

The academic literature offers a number of ways to measure inequality of opportunity. Among these, our purpose is best served by a scalar measure that is easily computable from the typical data available in developing countries. Developed by Bank staff in collaboration with external researchers (see Barros et al., 2009), the Human Opportunity Index (HOI) is an intuitive measure of a society's progress toward equitable provision of opportunities for all children. It has been used in two regional reports in Latin America, a study (in draft) for 20 sub-Saharan Africa countries, and numerous studies conducted (or in progress) for countries around the world. The focus of most studies has been children, with some applications to labor markets in recent studies.

HOI measures in a single indicator the coverage rate of a particular service, adjusted by how equitably the available services are distributed among groups differentiated by circumstance. The construction of the HOI involves aggregating circumstance-specific coverage rates in a scalar measure that increases with overall coverage and decreases with the differences in coverage among groups with different sets of circumstances. The index runs from zero to 100. A society that has achieved universal coverage in a particular opportunity (say, primary school enrollment) would score 100. On the other hand, a society that has an average primary enrollment of 50 percent that is unequally distributed in favor of children of certain circumstances (say, urban children) will have an HOI below 50, with the exact value depending on how unequal enrollment is among children of different circumstances (see Annex A). The measure also has a number of desirable and intuitive properties (see Annex B).

All results are subject to the caveat that HOI is estimated for a specified list of the circumstances, which could change if this list were to change. However, the HOI for any opportunity cannot be higher if more circumstances are added to the existing list. Thus if a society wants to measure equality of opportunity with reference to a larger number of circumstances (and groups) than we have considered, the measure of HOI we provide will serve as an upper bound to the "true" HOI that would take all circumstances into account. To compute HOI for a certain opportunity for the children of a country, household survey data are essential, with information at the individual (child) and household level. Computing HOI for a particular opportunity when the number of circumstances is relatively large requires an econometric exercise, which involves obtaining a prediction of HOI from observed access to opportunities and circumstances among children.

The HOI therefore is a unique representation of progress toward universal coverage of basic opportunities and the fairness with which access to those opportunities is allocated, in a single indicator.^{viii} It brings equity to the forefront of policymaking with an operational measure to track progress. The analysis is the first of its kind for the country and not only enriches the existing diagnostic work on poverty and inequality but also provides newer avenues for engagement with policymakers.

Opportunities and Circumstances for children in the Kyrgyz Republic

The HOI focuses on opportunities to improve a person's ability to expand his or her future production possibility frontier by investing in human capital in the early stages of her life cycle. For Kyrgyz Republic we focus on a number of basic services that are critical early in life to provide the opportunities to grow up in a reasonably healthy environment and receive a minimum level of education to function productively in society.

We restrict our analysis to children below the age of 17 for most of the opportunities we study. In addition to the intrinsic value of measuring access to key goods and services for children, focusing on young children also obviates the need to make the distinction between access and utilization related to effort, attitudes or preferences of the child or parents. What this implies is that as long as society agrees on universalizing an opportunity, it must ensure utilization by children, independent of the preferences of the child or her family.

Opportunities considered

For this analysis of human opportunities in the Kyrgyz Republic, we focus on three broad categories of opportunities that are critical for an individual, especially during early childhood. The three categories are the following: the opportunity to receive adequate education; the opportunity to receive a healthy start in the first few years of life, and finally; the opportunity to grow up in a household with housing conditions that are sufficient to provide a safe, stable and a stimulating childhood. (See Annex E)

Basic goods and services are usually not homogeneous. There can be significant variation in quality even for the same opportunity. To take the example of education, everyone may attend school and thus have the basic access to this opportunity, but the quality of the education may be substantially different depending on what kind of school it is, what kind of teachers teach in it etc. In such situations, school attendance alone cannot be an adequate measure of opportunity. In this report for the Kyrgyz Republic, we also use progression through school on time or timely completion of school as a measure of quality because while attending school is adequate to have access, completing school on time requires that children learn the content sufficiently well enough to progress from one grade to another. In order to capture quality of education encapsulated in grade progression, we use the indicator for having completed primary and secondary school on time for children aged 12-15 and 17-19 respectively. Finally, a more straightforward measure of learning in schools would be direct measurement of performance in standardized tests. For the Kyrgyz Republic we can assess the level of inequality in each of these measures of education.

Since the Kyrgyz Republic participated in the PISA, we use PISA test scores as a proxy for the quality of education. These tests are taken by children roughly when they are 15 years of age. We operationalize this in the following manner. For both Math and English, we consider a child to have the opportunity if her test score is higher than the average level of learning in the country. We also consider an alternative version where we use the regional average rather than the national average as the benchmark.^{ix} This is to account for the fact that the quality of educational learning as well as the level of aspirations (conditional on average student as well as teacher quality) may have strong local dimensions, particularly in a country such as the Kyrgyz Republic, which has high spatial/regional disparities. We do not necessarily take a stand on which of these may be a better approach but present results using both as each provides a useful way of interpreting the results.

For the opportunity to have a healthy start to life we consider the indicator on whether or not a child under the age of five is stunted – or has height-for-age – below two standard deviations of the WHO international reference population. This information is available from the Multi-Cluster Indicator Survey for Kyrgyz Republic for 2005/06. There is a growing body of evidence that nutritional deprivation in the early years of life has persistent long term effects into adulthood.^x In addition, we also use two indicators of access to medical care. The first is the opportunity to receive medical care when in need and the second is access to a drug store. The discussion of the results of these indicators of access to medical care, particularly the one on being able to access medical care when the care was required needs to be treated with caution. This is because the opportunity is defined on the subset of children requiring medical care as opposed to the entire population of children. Even if the likelihood of getting ill or requiring some form of medical attention were to be distributed uniformly among the population, it is likely that those with circumstances that make them more likely to be able to secure the necessary care would be precisely the ones more likely to be reporting to have needed it in the first place. If this were the only bias in place then the inequality measured in this indicator would be an underestimate of the actual inequality.

Finally, we also consider a set of indicators of amenities that capture the opportunity to grow up in a household with housing conditions that are sufficient to provide a safe, stable and a stimulating childhood. These include indicators related to household amenities such as drinking water and sanitation facilities; infrastructure facilities such as heating and power supply, and; connectivity related durable assets such as ownership of television, telephone and computer.^{xi} For power, unlike overall coverage we consider the quality of the coverage. So a child would be considered to have the opportunity of a good quality power supply if the household she lives in experienced a power cut of no more than once a week. Similarly, given that piped water and sanitation services such as the ones with toilets connected with individual or central sewage systems are largely limited to urban areas in the Kyrgyz Republic, we define these opportunities only for urban areas. The exclusion of rural areas from the analysis of these two opportunities recognizes the fact that these standards may not be realistic objectives for rural areas at this moment.

Circumstances considered

We consider five main circumstances to analyze the opportunities in the Kyrgyz republic: gender, family structure, urban/rural residence, region and parents' socio-economic background. Family structure is a variable that captures whether or not both parents live in the household. The region variable captures the oblast in which the child lives while and the urban/rural variable captures whether or not the child lives in the urban area or not. Parental socio-economic background is proxied by the highest education level of either parent in the base case. We use parental education rather than household consumption (the traditional indicators for standard of living) since household expenditure is not available in all three surveys. For robustness, we have redone the analysis using expenditure for those opportunities for which we can use this information. The results are presented in the annex and they are very similar to the ones conducted using parental education. Therefore we are comfortable using parental education rather than household consumption expenditure in the analysis in this report. We also include in the annex the analysis using two additional circumstances: total number of children and the total number of male children. Again since information on these two measures are not available for all surveys (particularly the PISA), we have not included these circumstances in the framework used in the main body of the report. (See Annex G)^{xii}

Key Findings

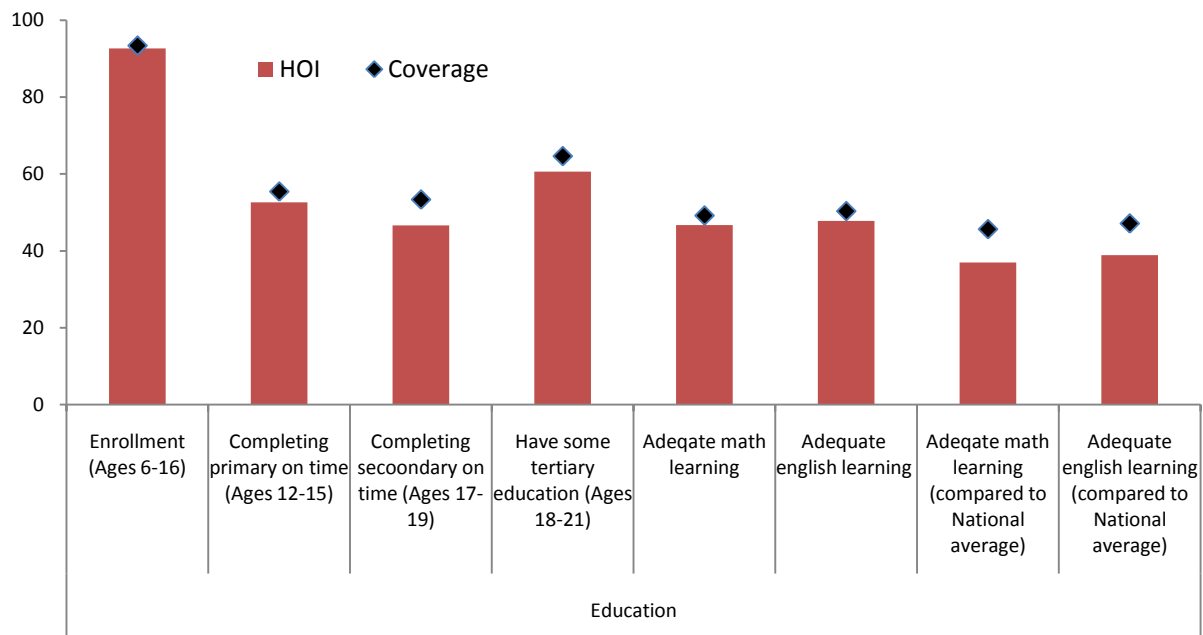
In this section, we present the key findings of the analysis for the Kyrgyz Republic. We present here a snapshot of the HOI as seen at one point in time during the mid to late 2000s. The basic results are summarized graphically in Figures 1 and 2.^{xiii} For every opportunity, the plotted dots denote the overall coverage rate while the corresponding bars denote the HOI. Note that HOI is essentially the coverage adjusted for the inequality in coverage based on the circumstances. In other words, the higher the inequality or the *dissimilarity index* as it known in the HOI literature, the higher the *penalty* due to this inequality and thus, for any given coverage rate, the higher the gap between coverage and HOI. So analytically, the difference between coverage and the HOI gives a measure of the underlying inequality.

Dissimilarity-Index: The Dissimilarity Index, or the D-Index as it will be referred to henceforth, is the measure of inequality of opportunity used in this analysis. Intuitively, the D-Index shows the share of available opportunities that needs to be “reallocated” across circumstance groups in order to achieve equality of opportunity for a given coverage rate. A D-Index above 5 is typically considered problematic for policymaking purposes.

The D-Index (D) is related to the human opportunity index (HOI) and the coverage (C) in the following manner.

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

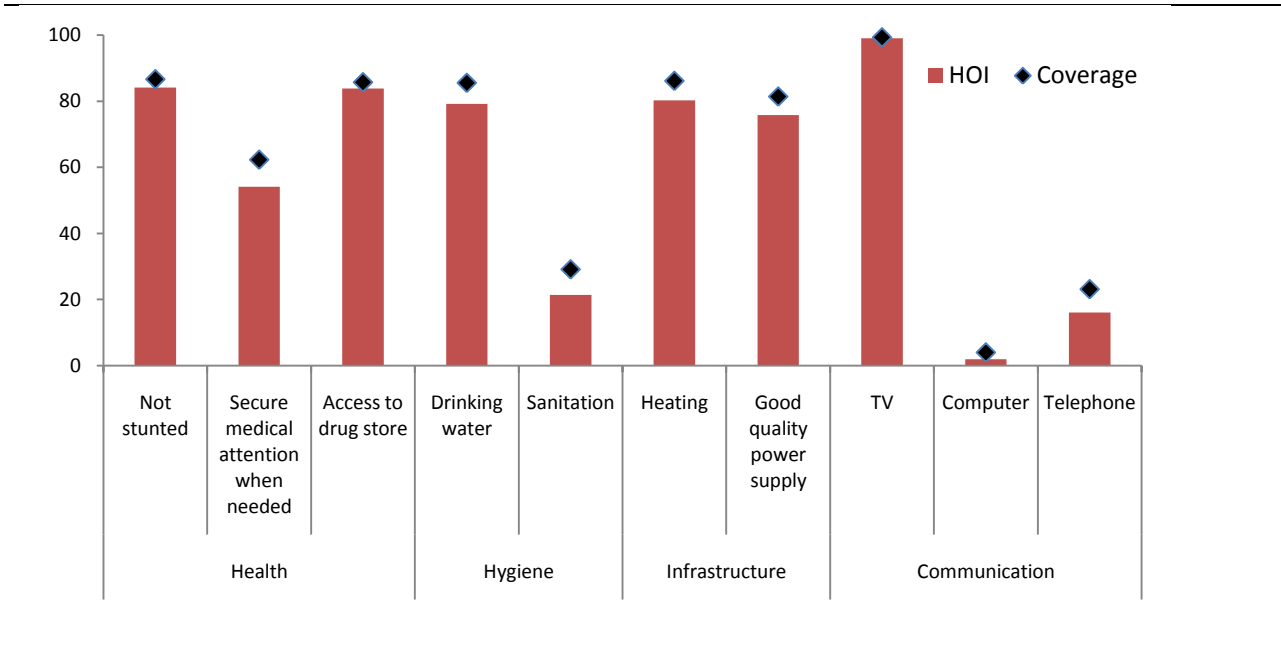
Figure 1: Coverage and HOI for opportunities in the education sector



The opportunities in the education sector that relate to school enrollment appear to be fairly universal in the Kyrgyz Republic: 93% of all children between the ages of 6 and 16 years are enrolled in school. Furthermore, the fact that the HOI for this indicator is also at 93% implies that this opportunity is distributed fairly equitably in the population. However, the results for quality of education are dramatically different. The HOIs for completing primary and secondary school on time (i.e., at the appropriate age) is 55% and 53% respectively. This suggests a gulf exists between access to education and quality of education provided. The relatively lower HOIs for the latter are possible symptoms either of late entry into schools or grade repetition. Furthermore for these indicators of quality, the gap

between coverage and HOI is also significant implying that access to good quality education is more likely for the privileged groups.

Figure 2: Coverage and HOI for opportunities in health, infrastructure and communication



Test scores provide another way of analyzing the quality of teaching and learning in schools. Using PISA scores for the Kyrgyz Republic, we compute HOIs for opportunities to access education that is of quality good enough to enable students to perform well in these tests. These test scores confirm what the progression numbers suggested: education quality is an issue in the Kyrgyz Republic. When we use the national average as the relevant benchmark for good performance, the HOI for adequate learning for Math and English are 37% and 39% respectively. These are of concern not only because they are low but also because they are highly inequitably distributed: among all the opportunities that we have analyzed for the education sector here, the penalty is the highest for these two.

In Figure2, we present coverage and HOI for the other indicators that capture opportunities in health and housing infrastructure/amenities. The HOI for the opportunity not to be stunted at age 5 is 84% which suggests that a sizeable number of Kyrgyz children are deprived of the opportunity of a healthy start to life. Although the HOI for access to drug stores is relatively high (84%), the HOI for the ability to secure medical care if and when needed, is much lower (54%) with substantial inequality by circumstances. Interpreting this particular opportunity requires caution because it is defined only on the

subset of children who reported having needed care which itself may be influenced by circumstances. In this situation the observed inequality is likely an underestimate since the ones who are under served are also the ones (a) that are more likely to get ill; (b) less likely to report their illness if they do get ill; (c) and less likely to be able to secure care when they need it in comparison to the relatively better-served. Nonetheless, even as a lower bound, we observe large inequality for this opportunity.

We also present the state of inequality in access to a number of other variables related to household infrastructure and amenities in Figure 2. The drinking water and sanitation indicators show that even when defined only for urban areas, there are substantial inequalities in access. The sanitation indicator is particularly dismal with HOI barely above 21%. Besides ownership of television – which is almost universal – there are substantial inequities in the access to the other services. Adequate heating is defined as heating for at least 4 months a year which is also the average number of months in a year the temperatures in the country are sub-zero. The HOI for this opportunity is 80%. The HOI for good quality power is similarly far from universal at 76%. The low coverage rate for computer access is not surprising and comparable to other countries in the region. The opportunity to live in a household with access to telephone service (including mobile telephones) is extremely low compared to other countries in this region.

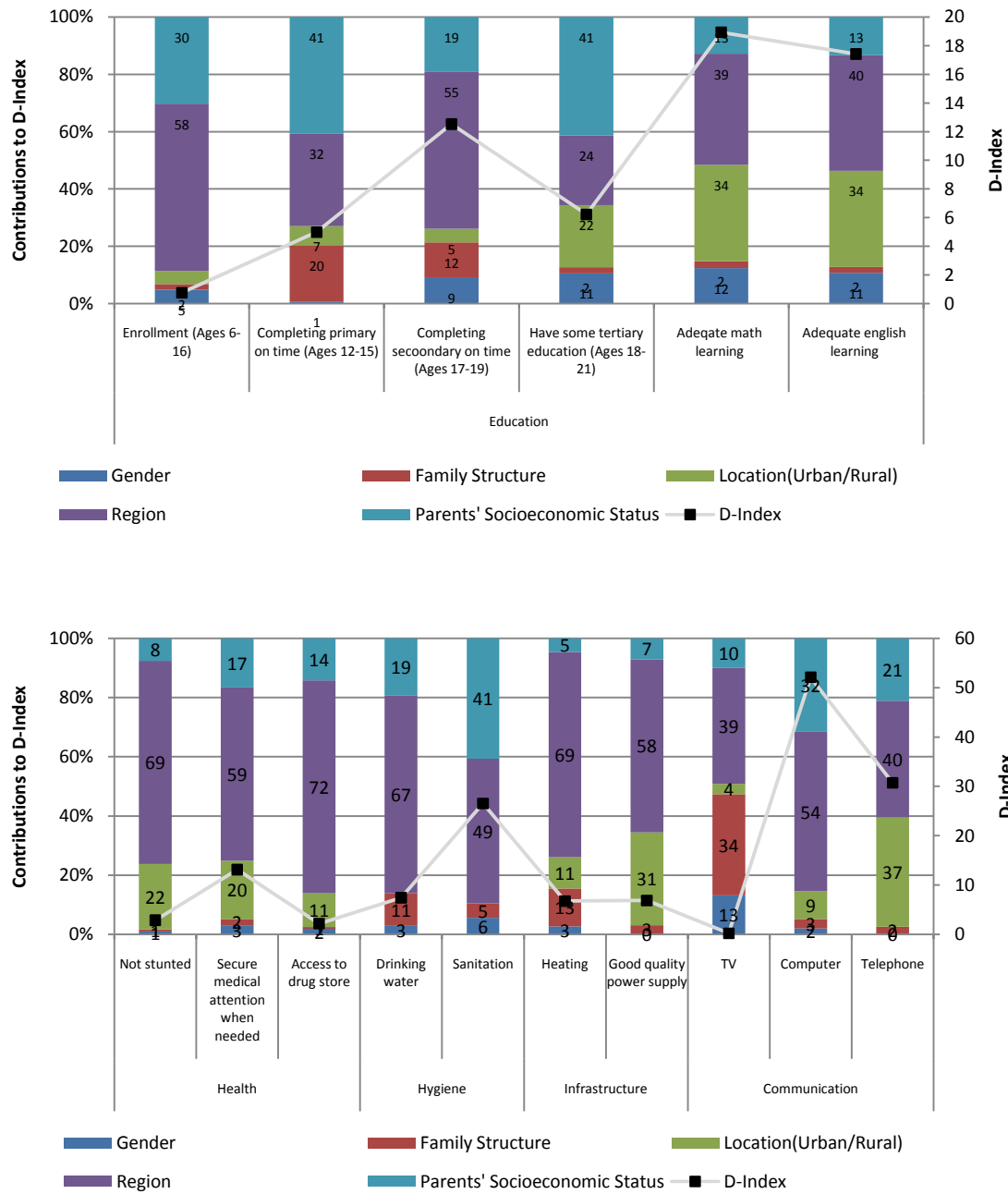
What circumstances contribute to the observed inequality of opportunity?

The analysis so far reveals that barring the opportunities to attend school and grow up in households with television, the Kyrgyz Republic is far from universal provision of basic services among children and there are large inequalities in how the available opportunities are distributed. Given this, it is of utmost importance to understand better the socio-economic characteristics that influence the child's likelihood of belonging to a group that is vulnerable (or underserved) in terms of access to opportunities. A better understanding of the dimensions along which inequalities are the starkest can be useful starting points for the analysis of policy options focusing on individual opportunities.

One way to pose this question is to ask the following: what is the “contribution” of a specific circumstance to inequality of opportunities among the key set of circumstances included in the analysis. As described in the earlier section, the measure of inequality used here – the dissimilarity index or the D-Index – can be decomposed conveniently into specific contributions due to each of the circumstances used in the analysis using the technique of the Shapley decomposition. We present the results of this decomposition in Figure 3 below. The black dots correspond to the total D-Index for each opportunity and the colored bars denote the shares attributable to each of the circumstances. For example, if we consider the opportunity of finishing primary on time, the overall inequality is 5%. Of this inequality, the largest share is explained by the socioeconomic status of the parents and the region in which the child grows up: together these two circumstances alone explain more than 70% of the observed inequality. The overall economic status of the household – which is proxied by the education level of the parent

with the highest education – also explains the largest shares of inequality in a number of other education related opportunities, particularly those that are related to the quality of the education.

Figure 3: The contribution of circumstances to overall inequality (Shapley Decomposition)



Interestingly, and as one might expect, the contribution of the oblast in which the child grew up becomes much more prominent for both Math and English test scores. In fact, a child's oblast of birth/residence as well as location of residence (urban/rural), jointly account for almost three quarters of the observed inequality in the test scores.

The contribution of oblasts to the overall inequality in access becomes starker when we look at opportunities related to health, hygiene and infrastructure related amenities. On average, region of residence accounts for 66% to the observed inequality in the health indicators we analyze, 64% in infrastructure, 58% in hygiene related opportunities and 44% in the ownership of household amenities. This implies that it is not households or individuals of certain characteristics but entire regions that are underserved in the Kyrgyz Republic. There are also some additional interesting patterns that emerge from this analysis. After the oblast of residence, the circumstance that seems to matter the most for opportunities in health and infrastructure related opportunities, including access to telephones, appears to be the urban/rural residence. This suggests that rural areas in certain regions may be particularly deprived of these opportunities. But for other opportunities such as access to sanitation and access to computers, a larger share is explained by parents' socioeconomic status. Oddly, a sizeable share of inequality in the access to television is explained by family structure – which in this case refers to whether or not the spouse of the household head lives in the household. But the level of inequality itself is miniscule given television access is almost universal.

Recall that parents' socio-economic status in the main analysis discussed here is proxied by the highest education level of the parents. This is because certain opportunities analyzed here that rely on data from MICS and test scores data from PISA do not have comparable data on household income/consumption to use that. However, limiting ourselves to opportunities from the KIHS (2010), we do repeat the analysis using household consumption instead of the education variable as a measure of a household's economic status. From the results presented in the Annex G we can confirm that the broad pattern of inequality as well as the ranking of its key drivers remains unchanged from what we have just described. The only slight change is that the share of inequality explained by household socio-economic status for almost all opportunities is higher when household consumption instead of education is used as its measure.

Profile of Vulnerability

Finally, the methodology underlying the analysis so far offers another way of looking at the importance of circumstances on the inequality in access to each of these opportunities. One can construct a circumstance based “vulnerability profile” of the children based on their predicted probabilities of accessing particular opportunities. These profiles allow us to identify who the underserved are, what their characteristics are and how this compares with those who have better than average access. In Figures 4 and 5, we present a snapshot of the vulnerability profile for a select group of opportunities. For each opportunity, the comparisons are between children in the lowest quintile of the predicted probabilities of access with those in the highest quintiles.

For infrastructure and health, for example, we see the sharpest differences for children living in Chuy (compared to the rest of the country), living in urban areas and for children with parents who have some tertiary education. For all four opportunities and of all children whose circumstances place them in the lowest quintile of access, none of them lives in Chuy. Conversely, more than 50% of those in the highest quintile live in that oblast. Similarly almost no child in the bottom quintile of probability of access to phones and computers comes from a households where the head some has tertiary education or lives in urban areas. The differences between the lowest quintile and the highest quintile for the other two circumstances are less pronounced. For computers and phones boys are relatively more likely to be in the top quintile of the probability of access. However, the opposite appears to be true for access to good nutrition (opportunity to not be stunted). There is also a clear urban bias: children with the best access to these opportunities are much more likely to be living in urban areas than in rural areas.

Figure 4: Vulnerability profiles for infrastructure and health related opportunities

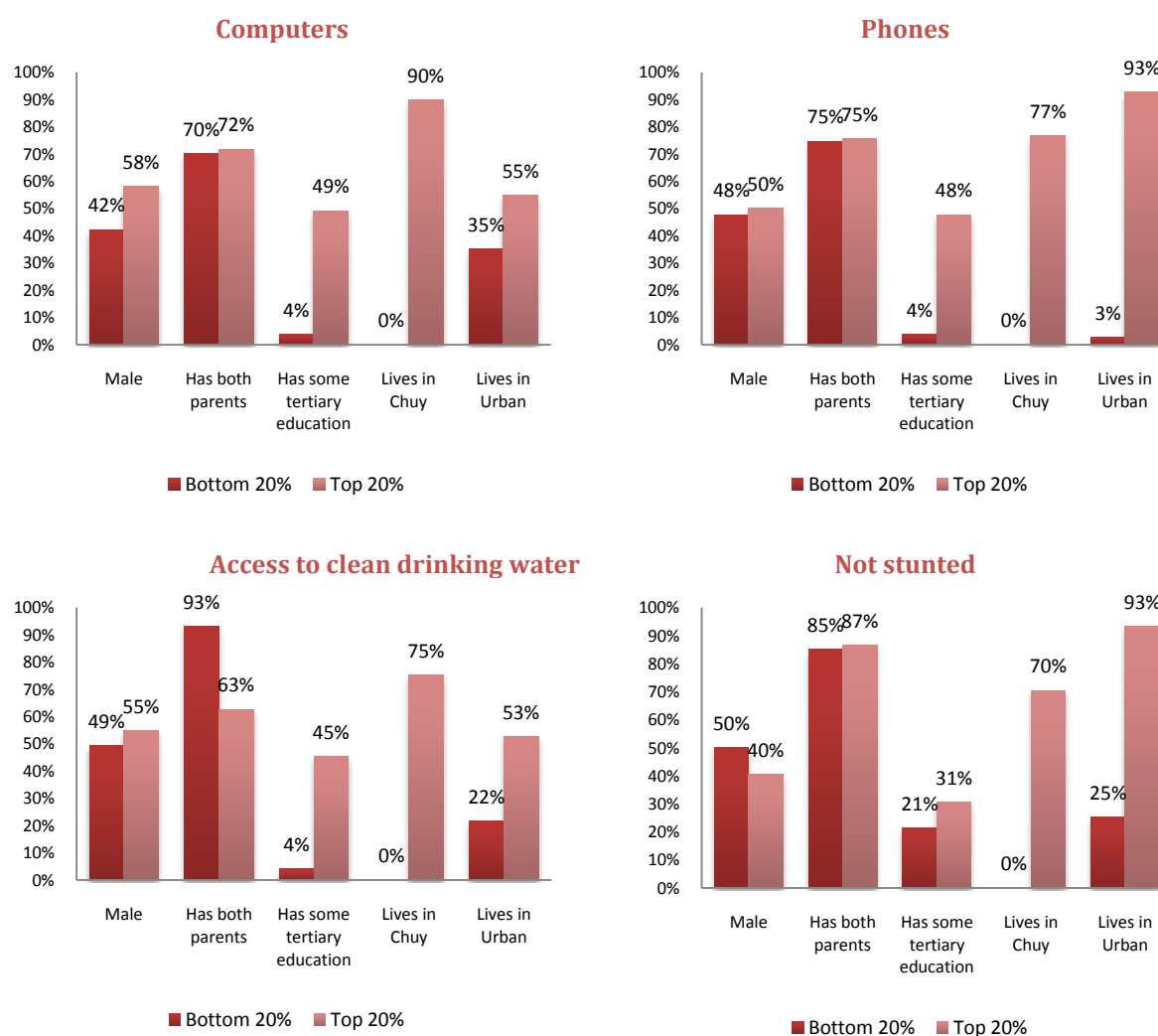
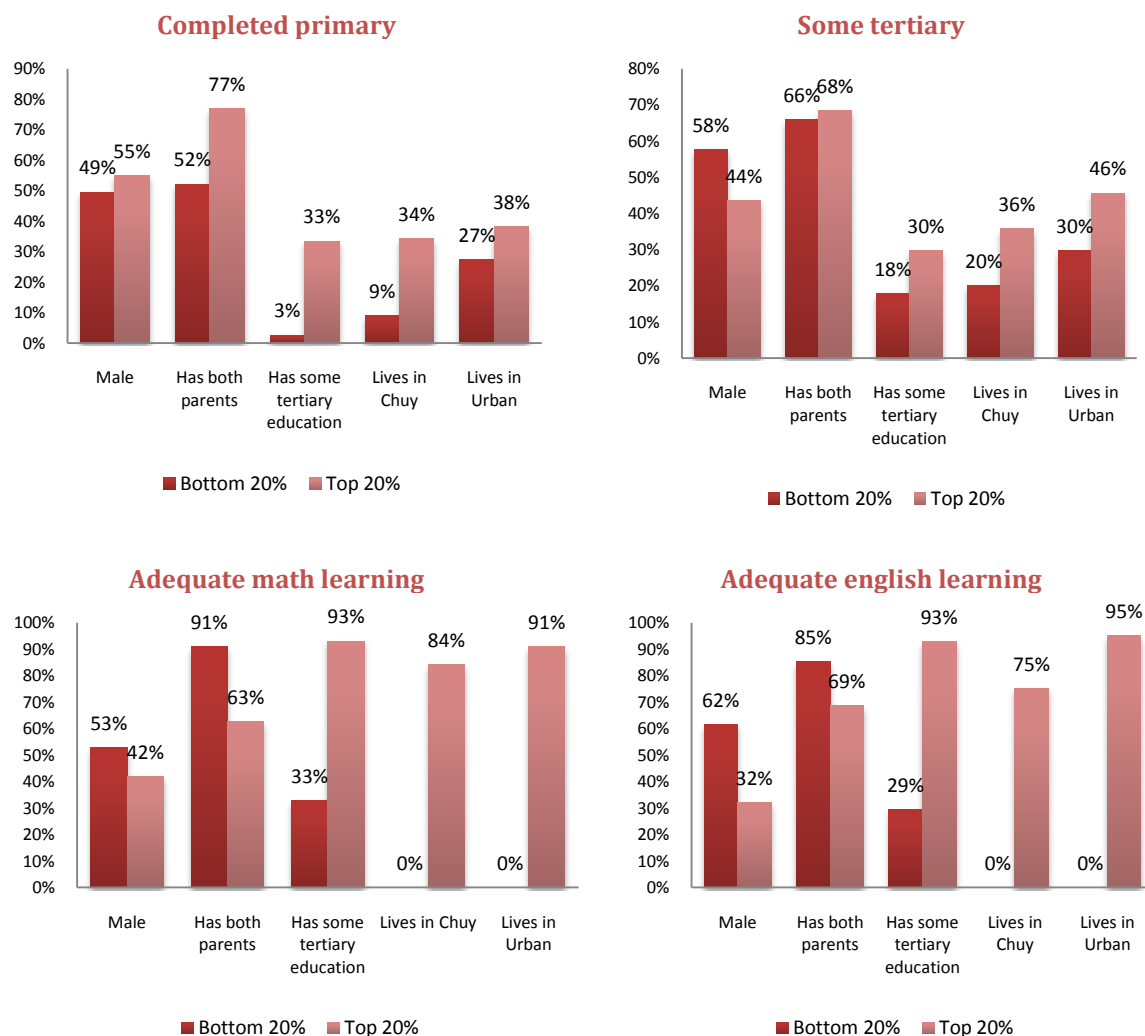


Figure 5 provides similar vulnerability profiles for the opportunities related to education. The children with the highest probability of having completed primary or have enrolled in some tertiary are more likely to have both parents at home, live in urban areas, live in Chuy and also have parents who have some tertiary education. For test scores, these differences are much more pronounced. None of the children with the very lowest probability of scoring above the national average in tests of reading and math live in urban areas in general while over 90 percent of those with the highest probability of doing so live in urban areas. The gender dimension is also interesting. For both math and reading test scores, distinctly lower than 50 percent the children with the highest predicted probability of scoring above the national average were males. This implies that at least up to the level at which PISA tests are administered, female children in the Kyrgyz Republic perform fairly well in the tests of math and reading.

Figure 5: Vulnerability profiles for education



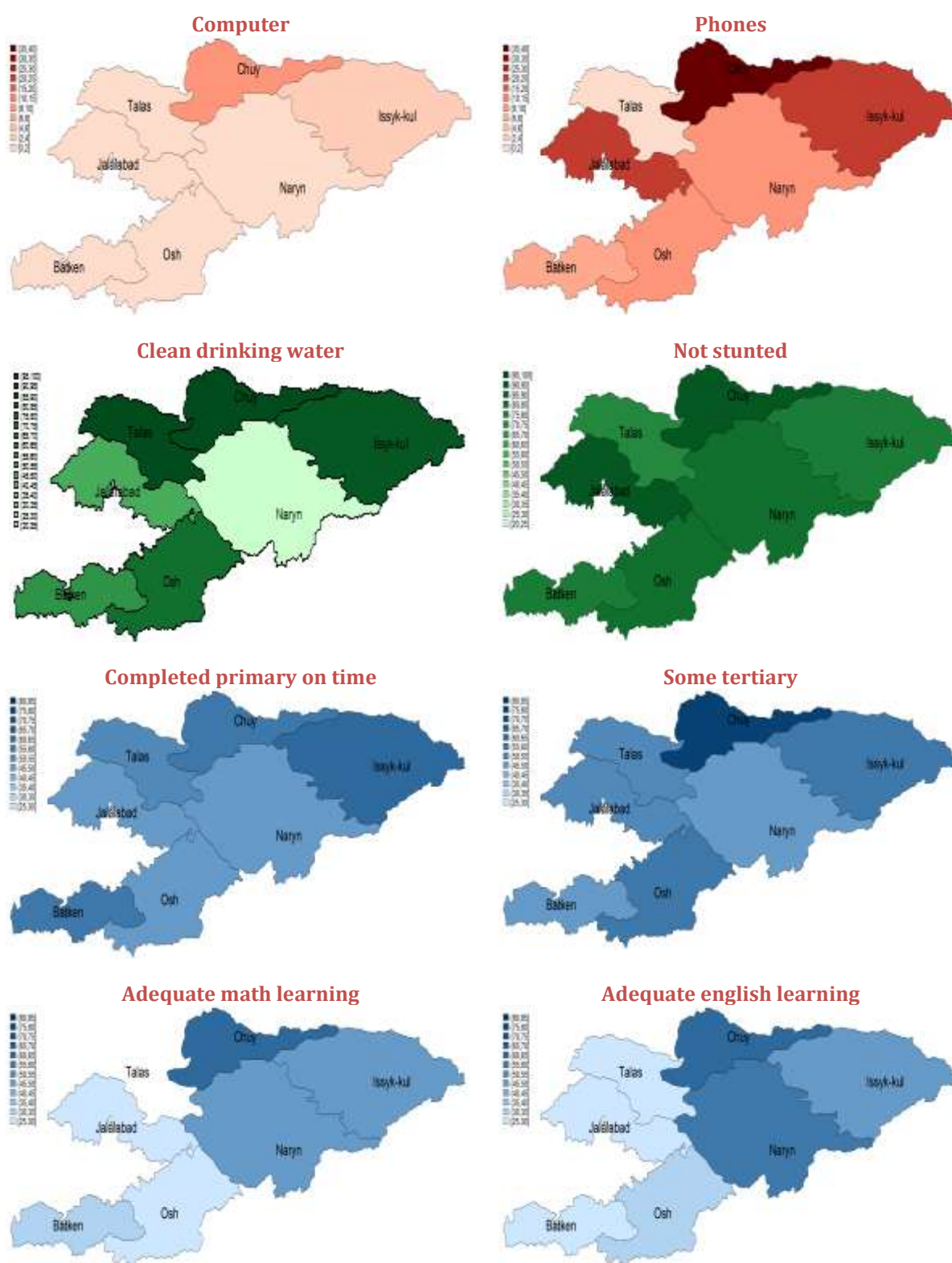
Overall, a vulnerable child for all opportunities is generally likely to belong to a household that lives outside Chuy and in a rural area and has no parent who has more than secondary education. In a way, this further reinforces something already alluded to in an earlier discussion: geography plays an important role in the distribution of opportunities in the Kyrgyz Republic. Together, oblast and rural/urban residence explain more than 50% of all the observed inequality in most of the opportunities discussed here.

Spatial distribution of opportunities

In order to further highlight these regional disparities in the distribution of opportunities, we also perform the analysis at the sub-national level. The methodology used here is the same as what is done earlier except for the fact that instead of using oblast of residence as a circumstance, the HOI is calculated separately for every oblast using every other circumstance. **Figure 6** shows the human opportunity indices for eight selected opportunities. Broadly, Chuy oblast does better than the other regions for all the opportunities and generally the northern region has better HOIs than the other regions. Specifically, for access to computers we see that Chuy oblast – which surrounds the capital city of Bishkek – has a higher HOI than the others. The access to opportunities related to telecommunications facilities also has substantial heterogeneity across the oblasts. The opportunity of not being stunted is fairly homogenous across most regions however for the access to clean drinking water the oblasts in northern regions have higher HOI than the oblasts in the south of the country. In the education sector, for completion rates there are very little differences across the regions. But sharper disparities appear when test scores are considered with regions such as Tala, Jalal-Abad, Osh and Batken clearly behind Chuy.

The juxtaposition of these opportunity maps with similar maps for poverty in the Kyrgyz Republic (not presented here) reveals a clear spatial correlation between poverty and opportunities. The oblasts where the incidence of absolute poverty is the highest – Naryn (52 percent), Jalal-Abad (45 percent), Osh (42 percent) and Talas (42) – generally are also the oblasts with the lowest HOIs for many of the opportunities analyzed here. At one level this is not surprising as poorer regions generally are also poorly provisioned with facilities that provide social services (e.g., schools and hospitals) and infrastructure amenities such as drinking water, sanitation, electricity etc. Some would in fact argue that the lack of these services is precisely why entire regions lag behind in terms of indicators of economic welfare. But HOI carries information not only on the coverage of these opportunities but also the underlying inequalities. So to the extent that poorer regions also regions with higher inequalities of opportunity, then the implication is that the prospects of economic mobility are lower precisely in the oblasts where one might think they are most needed and this in turn has consequences for the propagation of regional inequality in the country.

Figure 6: Sub-national HOIs for some selected opportunities



Summary of results and conclusion

There is broad consensus on the notion that guaranteeing access to a basic set of opportunities to every individual is fundamental to building a just society and fostering economic and social development. For children, in particular, most societies agree on the opportunities necessary to give them a decent start in life and realize their full productive potentials. The typical opportunities include, but are not restricted to safe water, adequate sanitation, nutrition, primary schooling of decent quality and so on. In this paper, we have taken stock of these opportunities in Kyrgyz Republic and examined the extent to which access to these opportunities depend on circumstances that the child cannot control nor can be held accountable for.

Our key finding is that the goal of equal opportunity remains distant in the Kyrgyz Republic: a child's circumstances such as her parents' socioeconomic status, region of residence, whether it is urban and rural etc. appear to have a substantial bearing on the extent to which certain services are available to her. Looking at specific opportunities, we find that in education, enrollments are close to universal but there are large gaps when one looks at measures of quality of education such as completion rates and test scores. Children in certain oblasts and within these oblasts, children whose parents are in certain socio-economic strata appear to have a lower chance at obtaining a good quality education.

Similarly, opportunities pertaining to a healthy start in life, adequate access to household infrastructure and amenities that ensure a stable, safe and stimulating childhood also have strong regional dimensions with entire regions being underserved. The oblast of residence accounts for over 60 percent of the observed inequalities in the health related opportunities analyzed here and roughly 60 percent of the inequality observed in the other infrastructure related opportunities. In addition, the regional distribution of opportunities in the Kyrgyz Republic appear to closely mirror the distribution of poverty: oblasts with the highest poverty are also the oblasts with the poorest provision of opportunities

Finally, what this report has done is taken a snapshot of the distribution of opportunities in the Kyrgyz Republic for a particular year. Conditional on data availability, it would be useful to conduct a similar analysis either for another time in the recent past or for another year with similar data. This would facilitate the analysis of trends and inform policymakers not only on whether opportunities have expanded or shrunk but also whether these changes have been driven by changes for the entire population or changes that have come specifically for the relatively underserved. This can then lead back to a discussion on policy. What kind of sectoral policies in education, health, drinking water, and other economic infrastructure can be used to enhance opportunities for all children? Would policies designed at improving the population level access ensure improvement in access for the underserved? Or would the policies need to be catered specifically to the underserved social groups being mindful of the equity dimension?

References

- Alderman, H. Hoddinott, J. and B. Kinsey (2006), "Long term consequences of early childhood malnutrition", *Oxford Economic Papers*, 58(3): 450-474
- Barros, R., J. Molinas Vega and J. Saavedra (2010). "Measuring Progress toward Basic Opportunities for All". Manuscript.
- Barros, R., J. Molinas Vega, J. Saavedra and M. Giugale (2010). *Do our Children Have a Chance? The 2010 Human Opportunity Report for Latin American and the Caribbean*. The International Bank for Reconstruction and Development/ The World Bank.
- Barros, R., F. Ferreira, J. Molinas Vega and J. Saavedra (2009). *Measuring Inequality of Opportunities in Latin American and the Caribbean*. The International Bank for Reconstruction and Development/ The World Bank.
- Barros, R. and J. Molinas Vega (2010). *Human Opportunities for Children in Brazil: An Assessment with the Human Opportunity Index*. Manuscript
- Hoyos, A. and A. Narayan (2011). "Inequality of opportunities among children: how much does gender matter?" Background Paper for WDR 2012. Manuscript.
- Roemer, J. (1998). *Equality of Opportunity*. Cambridge, MA: Harvard University Press
- Maluccio, J. A., Hoddinott, J., Behrman, J. R., Martorell, R. Quisumbing, A. R. and A. D. Stein (2009), "The impact of improving nutrition during early childhood on education among Guatemalan adults" *Economic Journal*, 119(537): 734-763
- Shorrocks, A. (1999). "Decomposition Procedures for Distributional Analysis: A Unified Framework Based on the Shapley Value" (mimeo). University of Essex
- World Bank (2006). *World Development Report: Equity and Development*

ANNEX A

How is the Human Opportunity Index calculated? A simple example

Consider two societies A and B in which half the population lives in rural areas and the other half in urban areas. Now consider a basic opportunity such as access to primary education. Say, 50 percent of all children go to school in both the societies. Looking at the overall coverage, both these societies will appear similarly placed. But, suppose we also know that in society A, no rural child attends a school; while in society B, 50 percent of both rural and urban children attend school. The HOI discounts the coverage rate of 50 percent by imposing a “penalty” when access is more unequal based on circumstances such as location. The imposed “penalty” can be interpreted as the share of the total number of opportunities that need to be re-distributed to ensure equitable access based on the equality of opportunity principle. Going back to the previous example, in society A, this will constitute “reallocating” 25 percent of total enrollments from urban children to rural children. Therefore, the penalty would be 25 percent and the HOI, which is the coverage minus the penalty, would equal 25 percent. For society B in our example, there is no inequality based on location and the penalty is zero. This implies that the HOI is 50 percent, or equal to the coverage. Therefore, society B is more equal than society A based on the equality of opportunity criteria, even though average enrollment rate is the same in both societies.

	Country A		Country B	
	Rural	Urban	Rural	Urban
Population of children	50	50	50	50
Population of children who go to school	0	50	25	25
Enrollment rate (%)	0	100	50	50
Coverage rate (C) (%)	50		50	
Dissimilarity index (D) (%)	25		0	
Penalty (P) %	12.5		0	
Human opportunity index (HOI) %	37.5		50	

ANNEX B

Three key properties of the Human Opportunity Index

First, the HOI is sensitive to scale – if access improves for all groups by, say, a factor of k (additively or multiplicatively), then the HOI changes by the same factor k . Second, it rewards Pareto improvement– if coverage rate improves for one circumstance-group without decreasing coverage rates for the remaining groups, the HOI will increase. Third, the measure will always improve if access changes in such a way that the more vulnerable groups (groups with coverage rates lower than the overall coverage rate) have higher access. An important caveat of this measure is that it is sensitive to the set of circumstances chosen for analysis. But this is mitigated by an additional property that is highly desirable given that it is often impossible to identify all relevant circumstances for any population and opportunity: the HOI will not be higher if more circumstances are added to the existing set of circumstances in the analysis. This implies that the computed inequality serves as a lower bound to the “actual” inequality where all circumstances of interest could be included in the analysis.

Source: Barros, Molinas and Saavedra (2011)

ANNEX C

Estimating the Human Opportunity Index from household survey data

To construct the HOI, we need to obtain the conditional probabilities of access to opportunities for each child based on their circumstances. In order to do so, one can estimate a logistic model, linear in the parameters β , where the event I corresponds to accessing the opportunity (e.g. access to clean water), and x the set of circumstances, (e.g. gender of the child, education and gender of the head of the household, etc). We fit the logistic regression using survey data:

$$\ln \left(\frac{P[I=1|X=(x_1, \dots, x_m)]}{1 - P[I=1|X=(x_1, \dots, x_m)]} \right) = \sum_{k=1}^m x_k \beta_k$$

Where x_k denotes the row vector of variables representing the k -dimension of circumstances. Thus, $x=(x_1, \dots, x_m)$ and $\beta'=(\beta_1, \dots, \beta_m)$ is a corresponding column vector of parameters. From the estimation of this logistic regression one obtains estimates of the parameters $\{\beta_k\}$ to be denoted by $\{\hat{\beta}_{k,n}\}$ where n denotes the sample size. Given the estimated coefficients, one can obtain for each individual in the sample his/her predicted probability of access to the opportunity in consideration:

$$\hat{p}_{i,n} = \frac{\text{Exp}(x_i \hat{\beta}_n)}{1 + \text{Exp}(x_i \hat{\beta}_n)}$$

The overall coverage rate, C , the D-Index, the penalty, P , and the HOI are estimated using the predicted probability \hat{p} and sampling weights, w :

$$C = \sum_{i=1}^n w_i \hat{p}_{i,n} ; D = \frac{1}{2C} \sum_{i=1}^n w_i |\hat{p}_{i,n} - C| ; P = C * D ; \text{ and } HOI = C - P$$

An important caveat to the logistic estimation model is that the list of regressors does not include any interaction terms between circumstances (e.g. between parental education and location). Given the number of circumstances we have (all of which are dummy variables), limited sample sizes, and the large number of countries and opportunities for which these regressions have to be run, including interactions would lead to intractable problems in at least some of the cases. The interaction terms are thus omitted, even though translating the exact definition of D-Index to the logistic regression model would require including these terms. If the interactions were included, it would result in a higher D-Index (and lower HOI), just as it would happen if more circumstances were added. This in turn implies that the estimated D-Index for all countries and opportunities is the *lower bound* of inequality of opportunities (and the estimated HOI is the upper bound) for a given set of circumstances.

Source: Barros, Molinas and Saavedra (2011)

ANNEX D

Shapley Decomposition of the D-Index – An Example

In country A we want to calculate the contribution of income to the inequality in access to a basic opportunity. The circumstances considered are the gender of the head of the household, the gender of the child, and the household income, and the opportunity is defined as having electricity in the household. The total D-Index is obtained using all circumstance variables and equals 3.48 percent. The D-Index using only income as a circumstance equals 3.24 percent and the index without circumstances (only a constant in the logistic regression) equals 0 percent. In order to obtain the marginal addition to the D-Index of income or DI, we estimated the D-Index with all possible sequences of circumstance variables where income can be added. In each situation we calculate the marginal contribution of income as the difference in the D-Index before and after income is added. Finally, we average the marginal contributions over all combinations. In a set with three circumstances (Income or I, Gender of child or G and Gender of head or H), there are six different sequences in which income can enter {(C,H,I) (H,C,I) (C,I,H) (H,I,C) (I,C,H) (I,H,C)}. Nevertheless, since in the regression model two sets of covariates with the same circumstances and different order generate the same result, there are only four different values for the marginal contribution of income. In the example below income contributes to 63 percent of the D-Index.

$$D_I = \frac{2}{6} [D(I,C,H) - D(C,H)] + \frac{16}{6} [D(I,C) - D(C)] + \frac{1}{6} [D(I,H) - D(H)] + \frac{2}{6} [D(I) - 0]$$

Circumstance set	Contribution to the D-Index	
gender head U gender child U income	D(gender head U gender child U income)	= 3.48
income	D(income)	= 3.24
Combinations of circumstance sets where income is added		
Circumstance set	Contribution to the D-Index	
income U gender child	D(income) - D(constant)	= 3.24
income U gender head	D(income) - D(constant)	= 3.24
gender child U income	D(gender child U income) - D(gender child)	= 2.40
gender head U income	D(gender head U income) - D(gender head)	= 1.29
gender child U gender head U income	D(gender child U gender head U income) - D(gender child U gender head)	= 1.50
gender head U gender child U income	D(gender head U gender child U income) - D(gender head U gender child)	= 1.50
Average contribution of income		= 2.20
% contribution of income		= 63%

Source: Hoyos and Narayan (2011).

ANNEX E

Opportunities and circumstances for Kyrgyz children

E1. Opportunities and their definitions

Opportunity	How is it measured?
Education	
Enrollment (Ages 6-16)	The question used is "Do you study right now ?"
Completing primary on time (Ages 12-15)	The child has completed primary school by age 15
Completing secondary on time (Ages 17-19)	The child has completed secondary school by age 19
Have some tertiary education (Ages 18-21)	Have some tertiary education vocational or otherwise
Adequate math learning	Has more than average level of learning for the nation and her grade. Alternatively this indicator is also defined by using the average level of learning for her region (oblast) and grade.
Adequate english learning	Has more than average level of learning for the nation and her grade. Alternatively this indicator is also defined by using the average level of learning for her region (oblast) and grade.
Health	
Not stunted	The child's height-for-age is above -2 standard deviation of the WHO international reference population.
Secure medical attention when needed	Th child needed medical assistance and it was provided.
Access to drug store	There is a drug store in the neighborhood and yakes less than 30 minutes to reach
Housing infrastructure/amenities	
Infrastructure	
Heating	The dwelling is heatedfor at least 4 months of the year
Quality of power supply	The power supply is not disconnected more than once a week
Hygiene related amenities	
Drinking water	The dwelling gets water from piped water to house/well/ artisan well/ private water pump
Sanitation	The dwelling has a toilet connected to central or individual sewage system
Communication/connectivity	
TV	The household owns a television
Telephone	The household has either a landline or a mobile phone
Computer	The household own a personal computer

E2. Circumstances and their definitions

Circumstances	Defintion
Gender	Gender of the child
Family structure	Whether or not the spouse of the household head lives in the household
Region	Oblast in which the child lives
Rural/Urban	Whether the child lives in urban or rural areas
Parents' socio-economic status	Education of the parent with the highest education.
Additional circumstances	
No. of children in the household	Total number of children who live in the household
No. of boys in the household	Total number of boys in the household

ANNEX F

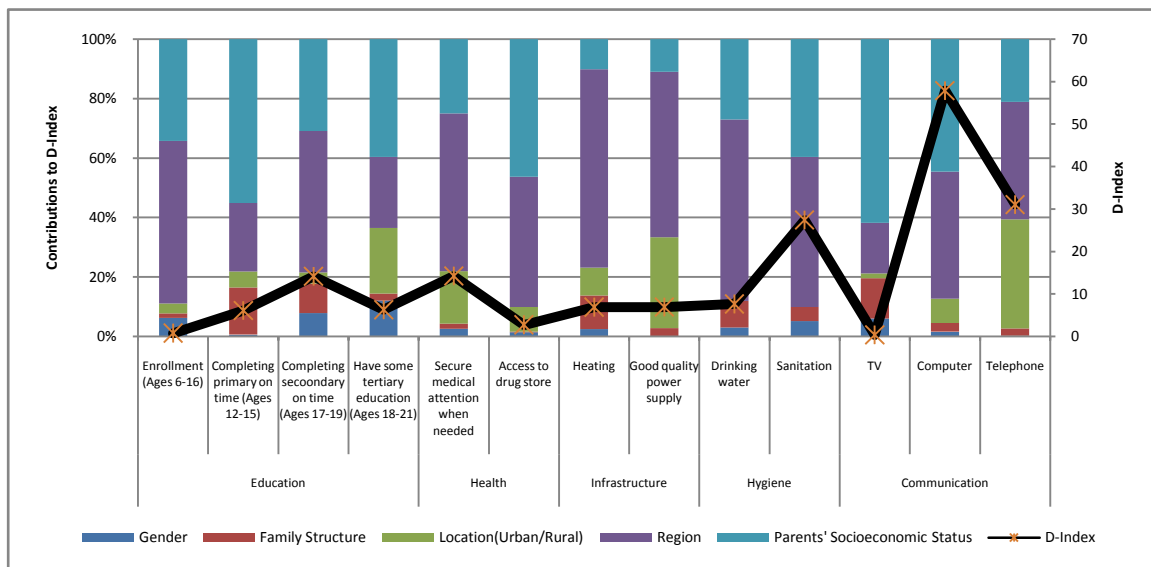
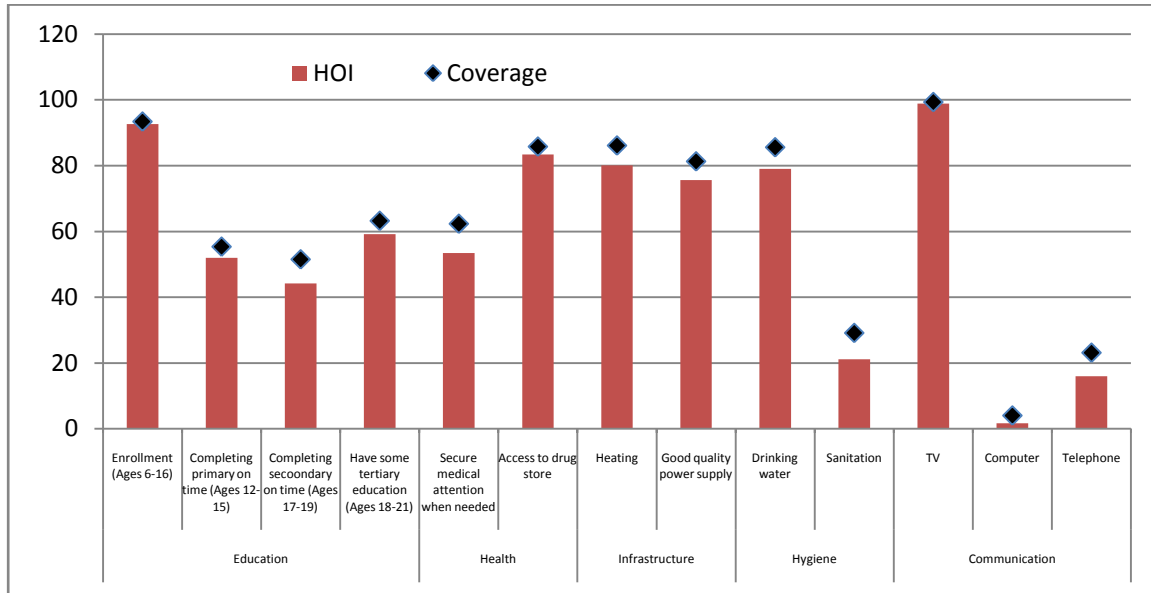
Summary of Key Results

	Coverage	Penalty	HOI	D index	SE
Education					
Enrollment (Ages 6-16)	93.4	0.7	92.7	0.7	0.6
Completing primary on time (Ages 12-15)	55.4	2.8	52.6	5.0	1.2
Completing secondary on time (Ages 17-19)	53.1	5.4	47.7	10.1	42.4
Have some tertiary education (Ages 18-21)	64.6	4.0	60.5	6.3	11.2
Adequate math learning (compared to national average)	45.6	8.8	36.8	19.3	0.8
Adequate english learning (compared to national average)	47.1	8.4	38.7	17.8	0.8
Health					
Not stunted	86.6	2.5	84.1	2.9	1.1
Not underweight	96.6	0.9	95.7	0.9	0.5
Needed medical assistance and received it	62.3	5.9	56.3	9.5	2.1
Access to a drug store	85.7	1.8	83.9	2.1	0.9
Household infrastructure and amenities					
Drinking water	85.5	6.4	79.2	7.4	1.2
Sanitation	29.1	7.7	21.4	26.5	1.1
Heating	86.1	5.8	80.3	6.7	1.5
Power supply	81.4	5.6	75.7	6.9	1.1
TV	99.3	0.2	99.1	0.2	0.2
Computer	4.0	2.0	2.0	51.1	0.2
Phones	23.1	7.1	16.0	30.9	0.8

ANNEX G

Coverage, HOI and Contributions to Inequality

Using household consumption instead of the highest education level of the parent as a measure of socio-economic status



ⁱ The Kyrgyz Republic: Profile and Dynamics of Poverty and Inequality, 2010 (PREM ECA, 2012)

ⁱⁱ Political riots were witnessed in the capital city in April 2010 after the resignation of the former president. This was followed by an outbreak of conflict in the southern parts of the country leading to an economic disruption. This was further exacerbated by rising food prices and the closure of borders with neighboring Kazakhstan and Uzbekistan.

ⁱⁱⁱ Estimating health effects on income is difficult due to problems in measuring health and the potential endogeneity of health (see Deaton, 2006). Studies like Bloom et al. (2004), Weil (2007), Lorentzen et al. (2008), Bloom et al. (2009), and Cervellatti and Sunde (2009), using different methods, have shown health effects on income or growth to be important and probably exceeding the reverse effect, namely that of income on health. The debate is however not fully settled yet, due to the difficulties mentioned above.

^{iv} Note however that while these correlations are *consistent* with the hypothesis that inequality of opportunity is harmful for economic prosperity in sub-Saharan Africa, they do not provide conclusive evidence to establish a causal relationship.

^v Perhaps most important for the proposed work are the contributions of John Roemer, whose 1998 work Equality of Opportunity was the first to formalize an equality of opportunity principle.

^{vi} See, for example, Chetty et al. (2010) for evidence that early childhood education has substantial long-term impacts, ranging from adult earnings to retirement savings (Chetty et al., 2010). Child malnutrition has also been shown to generate life-long learning difficulties, poor health and lower productivity and earnings over a lifetime (Alderman et al, 2006 and Hoddinott et al, 2008).

^{vii} Barros et al. (2009, 2010).

^{viii} Ibid.

^{ix} The results are similar apart from the fact that the D-index is higher when we use the national average rather than the regional average as the cut-off. This is not surprising since we are removing inequalities but taking region specific cut-offs.

^x Children who experience spells of malnutrition in their early childhood years have been found to have poorer test scores on cognitive assessments, activity level and attention span (Alderman et al, 2006). They also tend to start school later and are at a greater risk of dropping out before completing a full primary school cycle. In Guatemala, a recent study finds that being stunted at age 6 is tantamount to losing four grades of schooling in terms of performance in tests (Maluccio et al 2009). The accumulated evidence on child malnutrition suggests that children's learning potential in school and their productivity in later life is, to a large extent predetermined by their health and nutritional status before the age of two years.

^{xi} Water and sanitation are primary drivers of public health and improvements in these services have been shown to reduce incidence of diarrhea and its serious long term consequences such as malnutrition, pneumonia and physical and mental stunting. In that sense, these opportunities could have just as well have been categorized under the health opportunities. Similarly, access to electricity is a useful opportunity in itself. But it also facilitates access to other opportunities as it facilitates studying. It also improves access to information and reduces the time spent on physical chores etc. (Barros et al. 2010)

^{xii} The motivation for including the number of other children in the household as well as the gender of these children is to capture the well documented quantity-quality tradeoff in the investments in the human capital of children.

^{xiii} The numbers underlying these charts are presented in Annex F.