HACETTEPE UNIVERSITY
INSTITUTE OF POPULATION STUDIES

ASSESSMENT OF INEQUALITY OF OPPORTUNITY TRENDS FOR CHILDREN IN TÜRKİYE: 1993-2018

İbrahim Emre İLYAS

Department of Demography
Ph.D. Dissertation

Ankara,
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ABSTRACT

The study aims to analyze the inequality of opportunity trends among children in Türkiye between 1993 and 2018. Inequality of opportunity, which refers to the phenomenon when an individual's outcomes are determined by factors such as sex, ethnicity, and family characteristics that are beyond his/her control, is among the most significant challenges in the world today. It cripples the development process and hinders the demographic dividend by wasting the productive capacity, leading to inefficient resource allocation, and impairing institutions that are critical for development.

Using the Human Opportunity Index methodology and six Türkiye Demographic and Health Surveys conducted every five years from 1993 to 2018, the study analyzed the inequality of opportunity trends in 18 opportunities that can grouped under basic infrastructure (5 opportunities), education (4 opportunities) and health and nutrition (9 opportunities) categories. All the opportunities are derived from the Sustainable Development Goals.

The results indicate that there was a substantial improvement in the level and equality in access to the majority of opportunities. 12 out of 18 opportunities exhibited near universal level of coverage and a negligible level of inequality. The access rate to computer, internet, secondary education, full antenatal care, postnatal care, and immunization is comparatively lower. The inequality in access to these opportunities was high only for computer and internet ownership. Comprehensive interventions are still needed to ensure increased access and utilization of the opportunities with quality improvements in the basic services to eliminate inequality of opportunity.

Key words: inequality of opportunity, human opportunity index, demographic dividend

ÖZET

Bu çalışmanın amacı, 1993 ile 2018 yılları arasında Türkiye'deki çocukların maruz kaldığı fırsat eşitsizliği eğilimlerini analiz etmektir. Fırsat eşitsizliği, bireylerin çıktılarının cinsiyet, ırk, sosyoekonomik arka plan gibi kendi kontrolü dışındaki durumlar tarafından belirlendiği durumu ifade etmekte olup, bugün dünyada karşı karşıya kalınan en önemli zorluklardan biridir. Bu eşitsizlik, verimli potansiyelin israf edilmesi, kaynakların verimsiz bir şekilde dağıtılması ve ekonomik ile siyasi kurumların zayıflatılması yoluyla hem gelişme hem de demografik fırsat sürecini sekteye uğratmaktadır.

Çalışma, 18 temel fırsat üzerindeki fırsat eşitsizliği eğilimlerini, İnsani Fırsatlar Endeksi metodolojisi ve 1993 ile 2018 yılları arasında her beş yılda bir yapılan altı Türkiye Nüfus ve Sağlık Araştırması verisini kullanarak analiz etmektedir. Bu fırsatlar temel altyapı (5 fırsat), eğitim (4 fırsat) ve sağlık ve beslenme (9 fırsat) kategorileri altında gruplandırılabilen temel hizmetleri içermektedir. Tüm fırsatlar Sürdürülebilir Kalkınma Amaçlarından türetilmiştir.

Sonuçlar, fırsatların birçoğunda erişim düzeyinin ve erişimdeki eşitliğin önemli ölçüde arttığını göstermektedir. 18 fırsattan 12'si evrensele yakın düzeyde erişim ve ihmal edilebilir düzeyde eşitsizlik sergilemiştir. Bilgisayar ve internet erişimi, ortaöğretime devam, doğum öncesi tam bakım, doğum sonrası bakım ve aşılanma gibi fırsatlara erişim ise karşılaştırmalı olarak daha düşüktür. Bu fırsatlara erişimdeki eşitsizlik sadece bilgisayar ve internet sahipliği için yüksektir. Temel hizmetlerdeki eşitsizliği ortadan kaldırmak için, fırsatlara erişimi ve fırsatlardan faydalanılma düzeyini artırırken, hizmet kalitesini de iyileştiren müdahalelere ihtiyaç bulunmaktadır.

Anahtar kelimeler: fırsat eşitsizliği, İnsani Fırsatlar Endeksi, demografik fırsat

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ABBREVIATIONS

D-Index	Dissimilarity Index
EOP	Equality of opportunity
EU-SILC	European Survey of Income and Living Conditions
HDR	Human Development Report
HOI	Human Opportunity Index
IOP	Inequality of opportunity
MENA	Middle East and North Africa
OVG	Opportunity vulnerable groups
PISA	Programme for International Student Assessment
SDGs	Sustainable Development Goals
TIMSS	Trends in International Mathematics and Science Study
Turkstat	Turkish Statistical Institute
WDR	World Development Report
WIR	World Inequalities Report

1. INTRODUCTION

Inequality stands as one of the critical challenges our world faces today. It is defined as "*the quality of being unequal or uneven such as social disparity, disparity of distribution or opportunity, lack of evenness and the condition of being variable*" (Merriam-Webster, 2023). The Cambridge Dictionary, on the other hand, attributes a more philosophical meaning to inequality by incorporating the concept of "fairness" into the definition and defines it as "*the unfair situation in society when some people have more opportunities, money, etc. than other people*" (Cambridge Dictionary, 2023). It basically refers to disparities, differences, or uneven distributions that exist among individuals, groups, communities, or societies in various aspects of life.

Though inequality is mostly considered as an economic phenomenon, it manifests itself in all aspects of life including economic, social, political, and cultural contexts. Disparities in income, wealth, and access to economic resources such as property and capital necessary for economic advancement are well-known inequalities. Social inequalities are disparities in social status, access to education, healthcare, and social services, as well as differential treatment based on characteristics such as race, ethnicity, gender, sexual orientation, religion, or disability. Political inequalities include unequal access to political power, representation, and participation in decision-making processes, leading to differential influence in shaping policies and governance. Finally, cultural inequality refers to disparities in recognition, representation, and valuation of diverse cultural identities and practices within societies, leading to marginalization or dominance of certain cultures over others (Aktar & Alam, 2021).

Although categorized under different groups, strong interlinkages between different types of inequalities exist. Different forms of inequality often intersect and overlap since equality generally does not stem from a single factor but rather from a combination of factors that lead to multiple disadvantages. Furthermore, inequalities in one domain can reinforce disparities in another creating reinforcing cycles that exacerbate disparities in other aspects of an individual's life. Moreover, systematic,

and structural factors are generally the root causes of inequality. These systematic and structural forces create and enforce disparities in other aspects of an individual's life. All these factors lead to a complex network of interconnected inequalities. Hence, the inequalities are predominantly correlated. Individuals with better education tend to have higher income, accumulate more wealth, and live a healthier lifestyle. The uneducated, on the other hand, are more likely to fall back in the income distribution and have comparatively poorer health outcomes. Furthermore, the rich and educated are generally more likely to have influence and political power in the society they live in. These advantages or disadvantages can transmit from parents to children creating a vicious cycle that can last for generations.

Inequalities are undesirable for various reasons. The World Development Report 2006 (WDR) provides a detailed discussion of why inequalities matter (World Bank, 2005). Accordingly, inequalities are deemed unfair by most people especially if the individual does not have any responsibility or control over the inequality. This is consistent with the international system of human rights. The report further states that "*Different cultures and religions around the world may differ in important respects, but they all share a concern with equity and fairness. This suggests something quite fundamental about the value human beings place on them*". Hence, high inequality is an ethical and moral concern across cultures around the world. In addition, there is also an instrumental relationship between equity and development since high inequality hurts wellbeing in various ways. The WDR defines two channels of how inequalities cripple the development process. First, through wasting productive capacity and causing and inefficient resource allocation. When markets of capital, land, and human capital are imperfect, inequalities in power and wealth translate into unequal opportunities which, in turn, leads to a depreciation in human capital and allocation of resources to less efficient investments. Second, through impairing the economic and political institutions which shape the development process. On the other hand, UNDESA (2020) identifies three reasons why inequality matters. First, by impairing economic growth and poverty eradication, second by limiting social mobility across generations and third by influencing the political opinion and institutions towards the interest of few. In fact, both the WDR of the World Bank and

the World Social Report of the UNDESA refer to basically the same channels of how inequality hinders the development process, limits poverty eradication, and reinforces inequality.

For the same reason discussed in the previous paragraph, equality is also critical for the demographic dividend to be realized. Demographic dividend can be defined as the accelerated economic growth that stems from the increase in the working-age population due to the decrease in mortality and fertility as a result of the demographic transition. However, the demographic dividend is not automatic. That is, the bulk of the working age does not directly translate into economic growth. It needs to be accompanied by an equitable environment and policies that give a chance to everyone to realize his/her potential. Available studies demonstrate that providing quality education and promoting health to enhance the size and productivity of the labor force together with an enabling policy environment and sound macroeconomic policies are keys to the demographic dividend. Without these policies, the change in age structure will not translate into a demographic dividend. Even worse, it may lead to a negative dividend such as unemployment, low productivity, increased poverty, social unrest, and political instability.

Providing access to quality health and education services is critical for a demographic dividend. Therefore, public policy should focus on ensuring the universal provision of these services. That is, every individual especially children in society should have access to quality health services and education. However, it is not always possible mainly due to budgetary reasons. If this is the case, demographic dividend requires access to these services to be independent of factors such as income, location, race, sex, etc., because capable students, productive workers, good entrepreneurs, and good ideas can come from any group within the society. If access to health and education is high for some groups and low for others, then the limited resources may not be directed to groups where returns are higher.

Until the 1970s, the inequality concept was discussed mainly in terms of equality of outcomes. Since then, the distinction between outcome differences that can and can not be controlled by the individual is of prime interest. The studies of Rawls,

Sen, Dworkin, Arneson, and Cohen made significant contributions to this area. Their work indicated that the equality of outcome should not be the concern of the social policy, rather the policy interventions should concentrate on equalizing of means to realize the outcomes. They further suggested that the degree to which individuals utilize those means is not the business of society. In other words, "*an equitable society is not necessarily a society that makes all people equally happy, or equally rich, or equally educated. It is rather a society that secures for all of its members an equal chance to attain the outcomes they care about* (Ferreira and Peragine, 2015)."

Following the footsteps of the named scholars, Roemer (1998) developed the equality of opportunity (EOP) concept that is also employed in this study. He defined EOP as a state where an individual's outcomes are only determined by the degree of (accountable) effort s/he exerted and not by circumstances such as race, sex, or parental background that are beyond the individual's control. This concept is metaphorically called "leveling the playing field". Romer further claimed that "*What society owes its members under an equal opportunity policy is equal access, but the individual is responsible for turning that access into an actual advantage by application of effort* (Roemer, 1998)". Hence, ensuring full equality is not a social goal. Some inequalities can be conductive to economic growth since they provide incentives for additional effort, high talent, and innovation (Stiglitz & Doyle, Micheal, 2015).

Following the conceptualization of the EOP principle as a major social goal, the EOP literature focused on (i) measuring the inequality of opportunity (IOP) and (ii) designing public policies in a way to eliminate the available inequalities. The focus of this study is the former.

The objective of this study is to (a) analyze the level and trend of IOP among Turkish children from 1993 to 2018 and (b) identify the main circumstances that contributed to IOP in the same periods. More specifically, the study aims to answer the following questions:

i. What is the level of IOP among children in Türkiye?

ii. How has it changed between 1993-2018?
iii. What were the underlying dynamics of the change over time?
iv. Which circumstances contribute more to total inequality?

This study uses the Human Opportunity Index (HOI) methodology developed by De Barros et al. (2009) to answer these research questions. HOI is an EOP-sensitive coverage rate that measures how equitably the opportunities are distributed among circumstance groups. HOI tracks two dimensions of access to opportunities and combines them into a single measure. The first dimension is the coverage rate which shows how many opportunities, which are crucial for children to have a productive life, are available. The second dimension reflects the degree to which the available opportunities are distributed in line with the equal opportunity principle. The application of HOI requires selecting the opportunities and circumstances. Opportunities are services that i) are critical for human development and ii) their universal provision is a social goal. On the other hand, the circumstances are socially determined personal, family, or community characteristics over which individuals do not have control.

18 opportunities are selected for this study. These opportunities are categorized into three groups. The first group is infrastructure which includes five opportunities namely access to water, sanitation, computer, internet, and birth registration. The second group contains four education-related opportunities, including access to primary and secondary education, starting primary education on time, and completing primary education. The last category is the health and nutrition category which contains nine circumstances. These are basic and full antenatal care, assisted institutional delivery, postnatal care for children, immunization for the health subcategory, and non-stunting, non-wasting, non-underweight, and non-overweight for the nutrition subcategory. Seven circumstances were used in this study, namely sex of the child, household size, parental education, mother tongue, wealth, region, and type of place of residence (rural/urban).

The selected opportunities are derived from the Sustainable Development Goals (SDGs). The well-known concept of SDGs are at the heart of the global agenda,

and they provide a universal framework for a more sustainable, just, and prosperous future for all. The selected opportunities are directly linked with SDGs. They can either directly or indirectly be inferred from SDGs and SDG targets or they are already defined as an indicator to monitor the progress in the SDGs framework.

The data source of this study is the 1993, 1998, 2003, 2008, 2013, and 2018 Türkiye Demographic and Health Surveys (TDHS). All the selected opportunities and circumstances are derived from TDHS. The TDHS also allows for defining the selected opportunities in line with international standards.

The findings of the study indicate that access and equality have improved for the majority of opportunities. This is a significant achievement for Türkiye towards achieving EOP in children's access to goods and services. For 12 opportunities, universal access was achieved. This also implies that the level of IOP in access to these opportunities is negligible. Access to 6 out of 18 opportunities is not near-universal (less than 94 percent). These opportunities are computer, internet, secondary education attendance, full antenatal care, postnatal care, and immunization.

The level of IOP is low for the majority of opportunities. The D-Index, which is the measure of inequality in the HOI framework, is very low (2 percent or less) for 11 out of 18 circumstances. These opportunities are the ones with near-universal access. For four opportunities (immunization, full antenatal care, postnatal care, and secondary school attendance), the D-Index was also small at between 2 and 7 percent. For two opportunities (computer and internet access), the inequality is very high at around 33-34 percent.

For the majority of opportunities, wealth was the biggest contributor to the IOP. For 5 out of 6 opportunities with a D-Index larger than 2 percent, differential access of different wealth groups was the main source of inequality in 2018. Region and type of place of residence were also contributors to inequality. Unexpectedly, the sex of the child was not an important source of inequality for the majority of opportunities.

The decomposition of HOI over time indicates that most of this improvement came from scale effect signaling interventions aiming to increase overall access rather

than targeted interventions. Yet, the equalization effect, the improvements in the access of opportunity vulnerable groups without changing the overall coverage, was also an important factor in the improvements in HOI. The contribution from the composition effect was limited for most of the opportunities and periods.

The rest of the study is organized as follows. Chapter 2 provides a conceptual framework by discussing the relationship between demographic dividend and EOP. The study proceeds with a literature review in Chapter 3. This chapter first the studies that contributed to the development of the EOP principle. Then, it examines the studies that measure the level of inequality and identify opportunity-equalizing policies. The 4th Chapter explains the Human Opportunity Index (HOI) methodology including the computation of HOI, the decomposition of inequality over circumstances, and the decomposition of changes in HOI over time. The chapter also explains the limitations of the HOI methodology. Chapter 5 investigates the data source of the study. Then, the selection, definition, and validity of selected opportunities and circumstances are discussed in Chapter 6. Chapter 7 provides the results of the analysis and Chapter 8 discusses these results. Finally, Chapter 9 concludes the study.

2. CONCEPTUAL FRAMEWORK: DEMOGRAPHIC DIVIDEND AND EQUALITY OF OPPORTUNITY

This section analyses the relation between demographic dividend and EOP. It starts with investigating the demographic transition that initiates the demographic dividend. Then, the approaches regarding the relation between population change and development are elaborated. The literature shows that the age structure rather than the size of the population is the main driver of economic growth and development. This association between age structure and accelerated economic growth is called demographic dividend. However, the demographic dividend is not automatic, meaning that some policies need to accompany the change in age structure for the dividend to realize. In this respect, providing equal opportunities for everyone in society or EOP steps forward as an important contributor to the demographic dividend.

2.1 The Demographic Transition

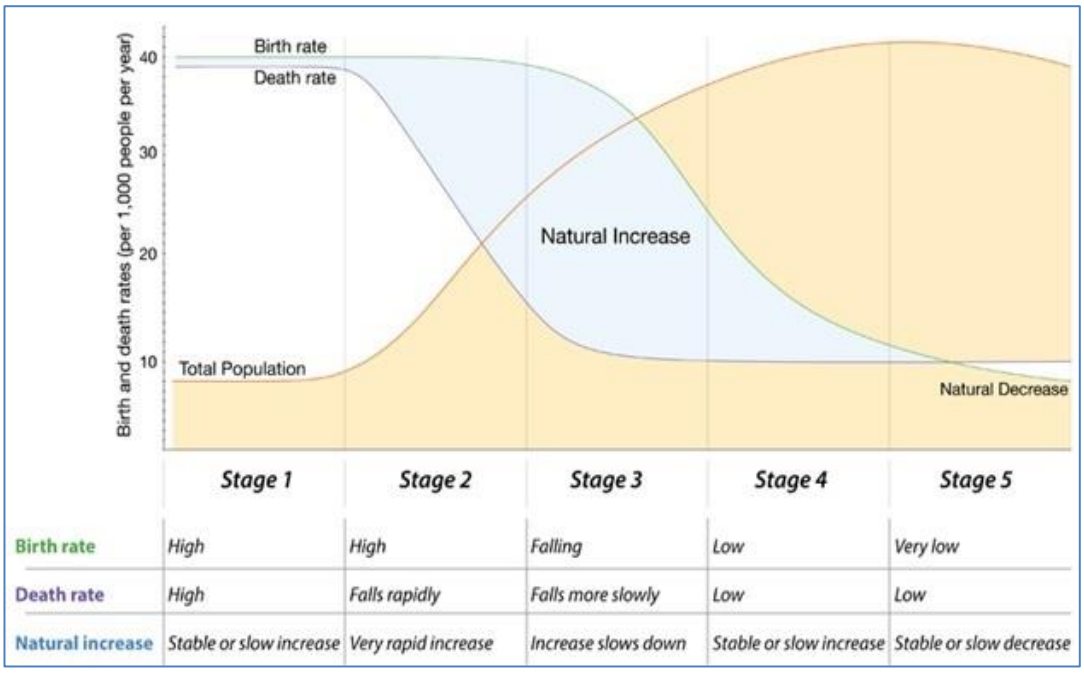
In the first half of the 20th century, demographers such as Thompson (1929) and Landry (1934) observed that developed societies had experienced a demographic transition from a state of high fertility and mortality to a state where both are low as a result of the modernization process. This phenomenon was later formulated by Notestein (1945) and his formulation was named the Demographic Transition Theory (DTT). The theory reveals the association between socio-economic and demographic changes. It is based on two main ideas. Primarily, predominantly agrarian societies with high fertility and mortality rates will slowly shift to a state of low vital rates as they industrialize. This transition will be followed by an increase in population since the mortality fall will occur in advance and at a much faster rate compared to the fertility decrease (Hodgson, 1983). The original formulation of the theory included three stages, but four and five-stage versions are also widely used. This study utilizes the five-stage version developed by Blacker (1949). This version of the theory is given in Figure 2-1 and the dynamics at each stage are elaborated below.

Stage 1-High Stationary. This stage features the demographic characteristics of a typical agrarian society. The birth and death rates are high. There is no use of

contraception therefore the total fertility rate is limited by the ability of childbearing. Mortality fluctuates at a high level due to famine, war, and epidemics. There is no or very low population growth. Blacker (1949) estimated that 22 percent of the world population was at this stage in 1930.

Stage 2- Early Expansion. The fertility is still high at this stage. However, mortality begins to fall sharply due to improvements in agricultural production, public health, and personal hygiene. The gap between births and deaths gives rise to an expansion in the population. There is a "youth bulge" in the age structure and the child dependency ratio is high. In 1930, 40 percent of the world's population was at early expansion state (Blacker, 1949).

Figure 2-1. Five Stages of Demographic Transition Theory



	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Birth rate	High	High	Falling	Low	Very low
Death rate	High	Falls rapidly	Falls more slowly	Low	Low
Natural increase	Stable or slow increase	Very rapid increase	Increase slows down	Stable or slow increase	Stable or slow decrease

Source: Roser (2019) from Our World in Data.

Stage 3- Late Expansion. This stage is characterized by low death rates and falling birth rates. Death rates keep falling but at a slower rate compared to 2nd stage. Urbanization, improvement in contraceptive technology, empowerment of women, and falling infant mortality lead to falling birth rates. Population continues to increase but at a diminishing rate. As the child dependency ratio declines and the proportion of

the working-age population rises, a demographic window of opportunity emerges. This shift has the potential to drive economic growth.

Stage 4- Low Stationary. At this stage, both vital rates are low and very close to each other. The total fertility rate approaches to replacement level, but the population grows slowly due to population momentum. The population starts aging.

Stage 5- Declining. The fertility drops below replacement level at this stage. This drop stems from changes in attitudes towards the family institution, a decrease in marriage and an increase in cohabitation, a rise of "individualism" and "self-actualization" and the wide availability of effective contraceptives (Lesthaeghe, 2006; van de Kaa, 2002). The mortality rate is still low, but since the fertility rate is lower than mortality, there is a negative natural increase. There is population aging. Blacker (1949) estimated that 16 percent of the world population was experiencing Stage 4 or 5 of the demographic transition in 1930. Wilson (2004) showed that half of the world's population was living in regions where fertility was below the replacement level in 2003.

Although demographic transition theory is referred as "*one of the best-documented generalizations in the social science (*Kirk, 1996, p.361)", it has some limitations. First of all, it is Eurocentric. It is based on the observations on the evolution of the population of the west European countries. Therefore, it is not fully applicable to all countries, especially to economically less developed countries. Secondly, the theory does not suggest any time scale regarding when the transition starts or how long each stage lasts. Data show that many developing countries have experienced the demographic transition at a much faster rate compared to west European countries and the dynamics at each stage may vary among countries. Thirdly, the theory ignores the impact of migration which can affect the social, economic, and demographic dynamics of origin or destination countries. Moreover, a recent study showed a reversal in the very low fertility levels in countries with a very high human development level (Myrskylä et al., 2009). Therefore the population dynamics in stage 5 can prove to be much more complex and various than foreseen by the theory.

2.2 Population Change and Economic Growth: Main Approaches

The population dynamics during the demographic transition are both reasons and results of many economic, social, and cultural changes. One of the most studied phenomena among these is the economic implications of population growth. Since fertility drops much later than the mortality during demographic transition, there is a high population growth during the second and especially third stages of the DTT. The economic implication of this is of prime interest.

"P*opulation and development are reciprocally and complexly interrelated* (Teitelbaum, 1976; cited in Furedi, 1997, p.95)", therefore there are various views regarding the effect of population growth on economy and development. The first view is the pessimist view. Malthus (1798) was the pioneer of this negative view. In his groundbreaking work "An Essay on the Principle of Population," he argued that the human population expands significantly faster than food production. This imbalance results in famine and impairs development if the population is not balanced by positive or preventive checks (Malthus, 1798). Much later than Malthus, Coale and Hoover (1958) identified three channels through which population growth hurt savings and capital accumulation and eventually development. The channels were the *age-dependency effect* which includes the diversion of savings to consumption at the household level due to the increase of dependency ratio, *capital-shallowing effect* which implies a decrease in the ratio of capital to labor and *investment-diversion effect* which implies the diversion of funds from so called productive investments to education and health (cited from Furedi, 1997). In the 1960s, the neo-Malthusian view that focused on environmental degradation rather than the shortage of resources was developed. According to this view, population growth leads to the destruction of the environment and the depletion of the earth's life-supporting resources. Consequently, this impairs development and endangers all forms of life on earth. Vogt (1949), Ehrlich (1968), Meadows et al. (1972) and Myers (1993) were among the supporters of this view.

The second view regarding the relation between population growth and development is the optimist view. This view is led by Boserup (1965, 1981) and Simon

(1977, 1981, 1992). They contended that population growth contributes to economic growth and innovation. They highlighted the problem-solving and innovation capacity of the human mind. Furedi (1997 p.7) contended that this view sees "*people as problem solvers"* not as the source of the problem.

The third view -the neutralist view- rose in the 1980s and 1990s. The studies of Bloom and Freeman (1986) and Kelley (1988) pioneered this view. Neutralists suggest that population growth itself does not boost or hurt economic growth. Other factors such as the quality of human capital, openness to trade, level of institutionalism within a country determine the direction of the relationship (Bloom and Canning, 2006). Furedi (1997) contributed to this view by suggesting that the effect of population growth depends on the specific circumstances that prevail in each country. He further claimed that *"demographic patterns are subject to numerous influences and do not priori work towards inexorable conclusions. …. The effects of population growth will be determined through socio-economic structures and cultural practices. To label the consequence of population growth as bad or good is to lose sight of the wider social perspective* (Furedi, 1997, p.8)*"*

2.3 Demographic Dividend, Age Structure, and Accompanying Policies

The studies discussing the relation between the size and growth of the population and development have dominated the literature until the end of the 20th century. However, these studies ignored a critical dimension that the population has its own dynamics: the age structure. As the population grows, the age structure changes, and since the economic behavior of age groups differ from each other so does the consequence of the population change (Bloom et al., 2003). Bloom and Williamson (1998) showed that the high economic growth in East Asian countries is linked to the increase in the share of the working-age population as a result of demographic transition. They contended that the increase in the working-age population accounted for one-third of the per capita GDP growth between 1965 and 1990. They further claimed that, if measured by the GDP per capita growth over the steady-state growth rate of 2 percent, the contribution of the population dynamics corresponds to half of

the excess growth rate. This phenomenon is called demographic dividend. It can be defined as the accelerated economic growth that stems from the increase in the working-age population due to the decrease in mortality and fertility. During Stage 3 of the demographic transition, the share of children decreases, and the share of the 15-64 age group increases leading to a low dependency ratio. This demographic change opens a window of opportunity for high economic performance. United Nations (2004) quantified the duration when the window of opportunity is open. Accordingly, the window of opportunity is open during the period when the share of the working-age population is at least 55 percent, and the percentage of the old population is less than 15 percent.

The demographic dividend works through three channels (Bloom et al., 2003). The first one is the increase in the labor force. Labor force increase comes from two sources. The obvious one is that the children born during the baby boom become adults (15+ years old) and they enter the labor force. The second source is the increased labor force participation of women. Since fertility drops, women will have fewer children and will be more likely to work. Moreover, if women come from small families, they are more likely to be educated and therefore more likely to enter the labor force.

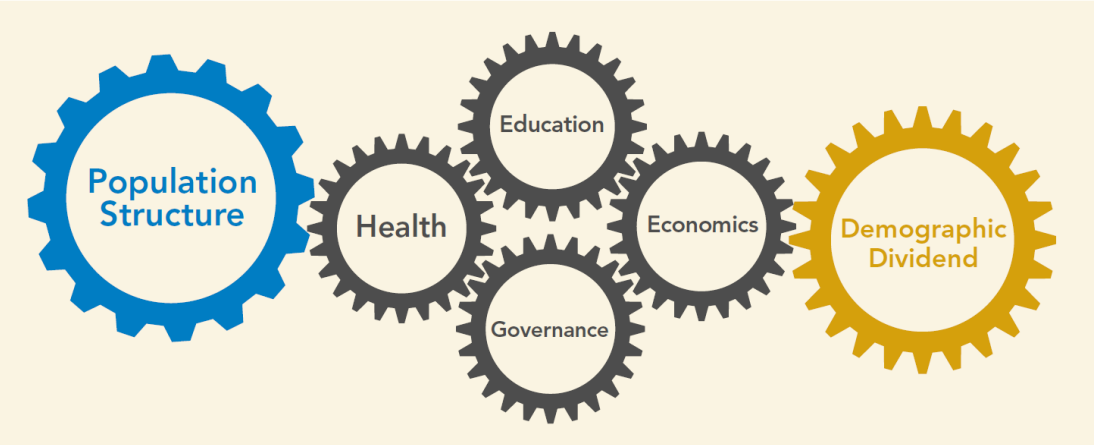
The second channel is the increase in savings. Adults, especially after age 40, tend to save a higher portion of their income compared to young or old. If the share of this age group increases in the population, then the national savings are also likely to increase. Moreover, the decrease in mortality increases the life expectancy. Therefore, people will be more likely to insure themselves for old age and tend to save more to smooth their lifetime consumption.

The third channel is human capital. As fertility decreases parents can invest more time and money in their children. This leads to healthier and better-educated children. Healthier and well-educated children become more productive labors leading to accelerated economic growth and an increased standard of living.

The demographic dividend is not permanent because the age structure itself is dynamic. The window of opportunity stays open for a limited time, and it eventually

closes. Furthermore, the demographic dividend is not automatic. A bulge in the working-age population does not guarantee high economic growth. The population change should be accompanied by the right set of social and economic policies. Highlighting this requirement, Population Reference Bureau (2013) defines demographic dividend as "*the accelerated economic growth in a countries economy that begins with a change in the age structure of its population and is achieved through strategic investments and policies*". There are numerous studies and policy briefs evaluating what the "*strategic investments and policies*" are. Bloom et al. (2003), Bloom et al. (2011), Gribble and Bremner (2012), COM (2013) and Population Reference Bureau (2013) are a few of those studies. All of these studies focus on four areas to a large extent. These areas are given in Figure 2-2 and discussed below in more detail.

Figure 2-2. The Enabling Environment for Demographic Dividend



Source: COM (2013)

The four policy areas in Figure 2-2 can be grouped into two groups (i) those aiming at increasing the size, quality, and productivity of the labor force and (ii) those aiming at an enabling environment and economic conditions so that the labor can be absorbed by labor market and translated into economic growth.

The first group of policies focuses on increasing the size, skills, and productivity of people. In other words, they aim to have people who are healthy, employable, and endowed with marketable skills. The first policy area of this group is

health. It is well established that good health fosters economic growth and poverty elimination. Recognizing this relation, Bloom et al. (2003) suggested that "*health equals wealth*". It is also estimated that improvements in health contributed to long-run global economic growth by 30-40 percent since the 1990s (Ünlü, 2017). A healthy population is also the main driver of demographic dividend. It works through three channels: well-organized health services increase labor force participation, enhance the quality of labor, and decrease the long-run health care cost. The first priority in this area is reducing child mortality and improving child health. Immunization, good nutrition, and regular health checks are key investment areas. These investments not only decrease mortality and improve the health of the child but also contribute to the development of cognitive skills which in the long term leads to a more skilled labor force. Improvements in public health are also crucial to achieve a demographic dividend. Improved sanitation and provision of safe water greatly improve public health. Moreover, health programs focusing on eliminating smoking, alcohol and drug use, and obesity help to have a healthy workforce. Furthermore, health improvements also help fight against social exclusion stemming from illness. Social inclusion makes sure that all the groups in the society participate in the development process and contribute to the achievement of demographic dividend. Reproductive health is another important area of investment. Access to reproductive services decreases unwanted pregnancies, prevents HIV and other sexually transmitted diseases, and contributes to achieving the desired family size. All of these factors enhance educational opportunities, especially for girls, hinder drop-out from the workforce, and contribute to the health of the next generation.

The second strategic policy area is education. The relation between education and economic growth is well-documented (see Mankiw et al.,1992; Barro, 1991; Hanushek and Kimko, 2000; Hanushek and Wößmann, 2007). First of all, labor force participation increases with education, especially for girls. Furthermore, as economies become more sophisticated, the need for a more educated workforce increases. More and better education (and training) directly contributes the workforce to acquiring the necessary skills, being productive and more competitive. Improvements in education also translate into better health. Educated adults on average; live longer, are less prone

to illness, have healthier lifestyles, and navigate better through the health system. To fully benefit from the demographic dividend, governments need to invest in all levels of education to make sure everyone has access to quality education.

The second group of policies in Figure 2-2 focuses on creating an enabling environment to promote economic growth. The first policy within this group is good governance. Regarding good governance, the Population Reference Bureau (2013) highlights the importance of a "*civil environment that encourages people to investment."* Rule of law, efficient government, and minimized corruption generate good incentives to invest and attract foreign investments. Similarly, Bloom et al. (2011) emphasized the quality of governmental institutions and contended that "*Governments that ensure respect for property rights, the sanctity of contracts, and the rule of law are more likely to be able to construct an economic environment that will facilitate realization of the demographic dividend. If a government is ineffective, it may not be able to bring about stronger economic growth by building on the opportunities inherent in the demographic transition"*. Another aspect of good governance is equitable policies. Gribble and Bremner (2012) and the Population Reference Bureau (2013) emphasize the importance of gender equality in particular. They suggested that gender equality fosters demographic transition and increases women's contribution to development. However, inequality in a much broader sense is required to widen the talent pool of the country and to make sure the potential of the society is fully utilized. Equitable policies increase the contribution of all groups within the society to development. WDR 2006 of the World Bank (2005) provides an excellent summary of how equity supports development. The report defines equity as having equal opportunities for all individuals so that they can pursue the life they choose. The report suggests that "*Institutions and policies that promote a level playing field— where all members of society have similar chances to become socially active, politically influential, and economically productive— contribute to sustainable growth and development."* According to the report, providing equal opportunities for all eliminates the inefficiencies that arise from market failures. These market failures are more pronounced in developing countries. Providing equal opportunity for everyone eliminates the correlation between wealth and investment decisions and makes sure

that the most capable children attend school, the best ideas are financed by banks and the most talented workers are employed. The report also states that, if equal opportunities are provided for all in society, this leads to a "*double dividend*". First, greater opportunities help the disadvantaged to improve their condition and second, this improvement in equity leads to enhanced institutional quality, reduced societal conflict, and more effective utilization of available resources and ultimately to better development prospects. The report further argues that equity is a fundamental component of long-term prosperity. Citing Cogneau (2005), it underscores a direct correlation between equal opportunities and the transmission of outcomes across generations. Therefore, equality-enhancing policies can break the so-called inequality traps and improve the statues of the next generation.

The fourth policy area is economic policies. Right economic policies that promote economic growth are needed to achieve the demographic dividend. Regarding these policies, Bloom et al. (2011) highlight (i) labor legislation that provides "*agreement about the relative power and role of labor*", (ii) stable macroeconomic management, and (iii) trade policies that are designed in line with country-specific circumstances. Similarly, Gribble and Bremner (2012) emphasize the importance of trade policies to increase exports, incentives that increase savings, ease of access to credit, wage regimes that are responsive to the market, and tax incentives to encourage investments.

To sum up, investing in health and education, an enabling policy environment and sound macroeconomic policies are keys to the demographic dividend. Without the right set of policies, the change in age structure will not translate into dividend. In the worst scenario, the absence of the right policies may lead to high unemployment, low productivity, increased poverty, social unrest, and political instability. The consequence may get even worse as the population ages considering that the aging population will lack the necessary care and capital to survive in old age (Bloom et al., 2003).

Providing access to quality health and education services is critical for the demographic dividend. Therefore, public policy should focus on ensuring the universal

provision of these services. That is, every individual especially children in society should have access to quality health services and education. However, it is not always possible mainly due to budgetary reasons. If this is the case, demographic dividend requires access to these services to be independent of factors such as income, location, race, sex, etc., because capable students, productive workers, good entrepreneurs, and good ideas can come from any group within the society. If access to health and education is high for some groups and low for others, then the limited resources may not be directed to groups where returns are highest. This approach that requires access to basic services is not determined by predetermined factors such as income, family background, etc. is called EOP and it is discussed in the following part more in detail.

3. LITERATURE REVIEW: EQUALITY OF OPPORTUNITY

WDR 2006 characterized EOP by the idea that an individual's accomplishments in life should be determined by their talent and hard work, rather than being dictated by predetermined factors. The concept suggests that everyone should have an equal starting point and opportunities, allowing individuals the freedom to pursue their desired life path. However, exceptions might be made for those who face extreme deprivation in outcomes, acknowledging the need for additional support in such cases. The report asserts that IOP results in wasted human potential by transferring deprivation between generations, crippling individual and overall prosperity and economic growth. There are numerous studies supporting the view of the report. Marrero and Rodríguez (2013) stated that IOP leads to lower human and physical capital accumulation which results in lower economic performance. Their empirical analysis for the USA showed a significant association between IOP and economic growth and decreasing IOP by one standard deviation would increase growth by 1.2 percent and per capita income by 274 USD. Similarly, the study of Mejía and St-Pierre (2008) showed that a lower degree of IOP is associated with a higher human capital level, a higher share of people investing in human capital, and a lower inequality in human capital distribution. Galor and Zeira (1993) had also similar findings. They asserted that inequalities in income and opportunities reduce the access to credit for disadvantaged individuals disallowing them to attain better and higher levels of education or to find finance for profitable projects. This results in the underutilization of talent and affects growth negatively both in the short and long run. Banerjee and Newman (1993), Chiu (1998) and van de Gaer et al. (2001) are some other noteworthy studies that conclude that inequality hurts human capital formation, growth, development, and intergenerational mobility.

In light of these findings, this section presents (i) the conceptual literature that examines studies that contributed to the evaluation of the concept of (I)EOP and its sources and (ii) the empirical literature that covers the studies that measure the level of and contributors to IOP.

3.1.1 Conceptualization of the Equality of Opportunity

Until the 1970s, the inequality concept was discussed mainly on the basis of equality of outcomes. Since then, the distinction between outcome variations that are within and beyond an individual's control is of prime interest. Rawls (1971) was among the pioneers of this idea. In his influential book, he developed two main principles. According to his first principle (principle of equal liberty), every person should enjoy "*most extensive liberties with similar liberties for all*". His second principle (the difference principle) contended that "*inequalities are just if they are both for the benefit of the least advantaged persons and attached to offices and positions open to all under conditions of equality of opportunity.*" These two principles together imply that, given equal liberties and basic rights for all citizens, the inequalities are just if they are for the benefit of everyone and if EOP prevails (i.e. if it is possible for everyone to acquire skills that are necessary to get a position or an office). He developed the notion of "*primary goods*" which he defined as "*things that every rational man is presumed to want*" such as civil and political rights, liberties, income and wealth, and the social bases of self-respect.

Sen (1980) argued that Rawls' approach has serious limitations. He claimed that focusing on (primary) goods rather than the functions of those goods evokes "commodity fetishism" and highlighted that "*Rawls takes primary goods as the embodiment of advantage, rather than taking advantage to be a relationship between persons and goods*." According to Sen, primary goods are not ends themselves they are only means to an end. What really matters is what people are actually able to *"be"* and *"do"*. The goods or wealth or utility associated with those commodities provide partial knowledge regarding the actual well-being of the person. Instead, Sen proposed that the focus needs to be on the functioning of these goods defined as observable *"doings"* and *"being"* such as escaping morbidity and mortality, being adequately nourished, appearing in public without shame and so on (Sen, 2003)[4]. Moreover, Sen contended that the policy maker should not focus on equalizing some level of

[4] This approach of Sen is named capabilities approach.

functionings (or achievements) but on the opportunity of attaining the relevant achievements (Ferreira and Peragine, 2015).

In 1981, Dworkin published two papers regarding what the subject of equality should be. In his first paper, Dworkin (1981a) suggested that *"equality of welfare"* should not be the objective of social policy because this understanding implies that individuals are not responsible for their preferences. Especially, if someone has high preferences or expensive tastes, giving additional resources to this person to fulfill her preferences is ethically unacceptable. In his following work, Dworkin (1981b) argued that it is the resources that need to be equalized. The resources are the "*aspects of physical and biological environment for which the person should not be held responsible* (cited in Roemer and Trannoy, 2016)". In other words, Dworkin argued that the inequality of an outcome is just if it is the result of the choices of persons after an equal distribution of resources[5].

In their almost simultaneous studies, Arneson (1989) and Cohen (1989) criticized Dworkin for holding people responsible for all their preferences. They claimed that people might have developed preferences that were formed under disadvantageous circumstances and that are not under their control. They further contended that people should be responsible for only what they can control. Arneson (1989) and Cohen (1989) defined opportunity as "*a chance of getting a good if one seeks"* and *"an access to an advantage"* respectively and argued that the goal should be equalizing opportunities, not resources.

The works of Rawls, Sen, Dworkin, Arneson, and Cohen are significant contributions that raised EOP as the right basis of the theory of justice. They may have differential approaches on the subject but they share a core. That core is that the right focus should not be on the equality of outcomes but on the equality of means to realize the outcomes and the degree to which individuals utilize those means is not the business of the society. Ferreira and Peragine (2015) perfectly put it as follows: "*an equitable society is not necessarily a society that makes all people equally happy, or*

[5] The only exception is natural handicaps who should be provided with extra resources.

equally rich, or equally educated. It is rather a society that secures for all of its members an equal chance to attain the outcomes they care about."

Roemer (1998) developed the EOP concept that influenced this study. This concept is metaphorically named *"leveling the playing field".* According to Roemer, an individual's prospects should not be determined by their circumstances such as race and sex that are beyond one's control, rather the outcomes should reflect only the degree of effort. He recognized Arneson's (1989) and Cohen's (1989) assertions and defined "accountable effort" –the effort that is independent of the circumstances- and contended that the outcome should solely depend on the degree of accountable effort (Roemer and Trannoy, 2016). He further claimed that "*What society owes its members under an equal opportunity policy is equal access, but the individual is responsible for turning that access into an actual advantage by application of effort* (Roemer, 1998)*".* Roemer also argued that society must undergo an ethical and political procedure to determine the appropriate conditions. He believed that these conditions might encompass factors related to one's social background, which individuals cannot influence, like gender, ethnicity, race, caste, parental background, or birth location.

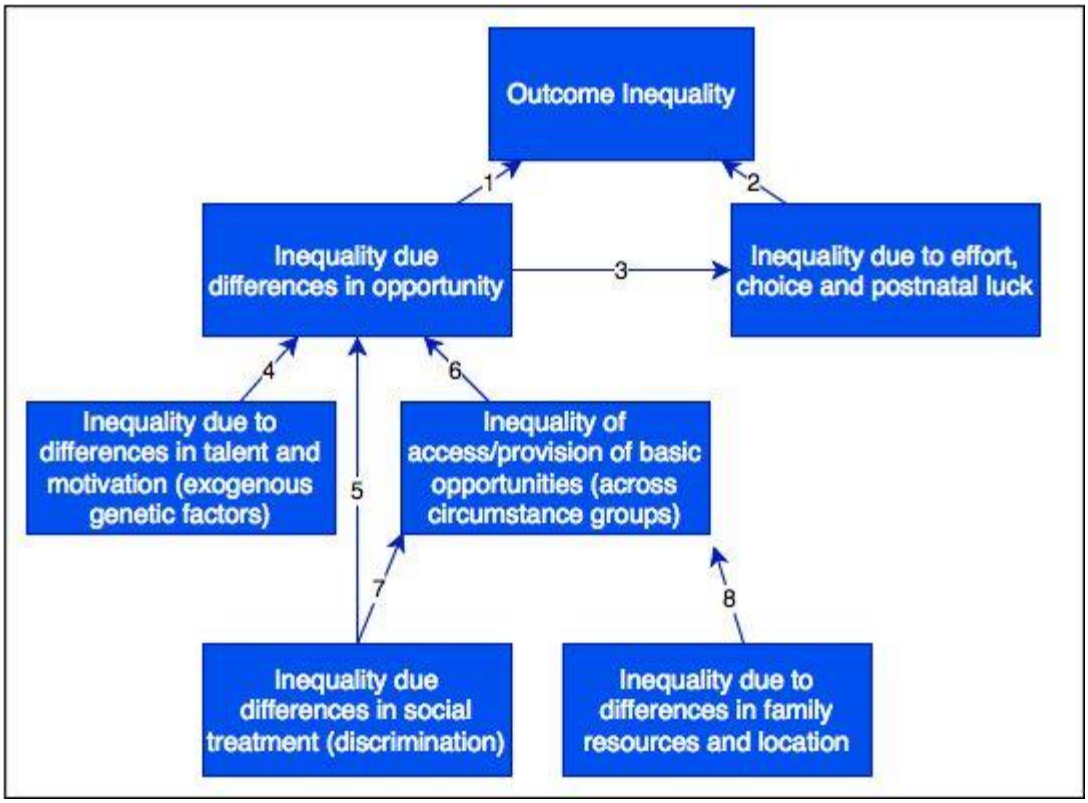
Roemer (1998) also developed an opportunity-equalizing policy rule. According to this rule, society is partitioned into T types with respect to circumstances that are beyond the individual's control and every type has an effort distribution. Then, the outcome is defined as a function of effort and social policy (available resources). Roemer suggests that the available resources should be distributed in a way that everyone at the same centile of her effort distribution should have the same level of outcome. Said differently, what he suggested was not equalizing outcomes of all, but only of those who exerted the same level of effort. Once the resources are distributed according to this rule, the individual's outcome depends only on the accountable effort. Using this rule, Betts and Roemer (2005) examined the allocation of educational resources in the US and found that equal opportunity policies allocate at least five times more resources to the most disadvantaged students than to advantaged students. (as cited in Pignataro, 2012).

3.1.2 Sources of Inequality

Tackling inequality requires a full understanding of its roots. De Barros et al. (2009) developed a framework for this purpose using the notion of Roemer (1998). Figure 3-1 summarizes this framework. The box on the top demonstrates the inequality in outcomes such as wealth, earnings, consumption, educational achievements, etc. The inequality in outcomes originates from two main sources. The initial source involves variations in opportunities among different circumstances. It arises because people with different circumstances face different opportunity sets. The factors beyond one's control determine the opportunities that she will enjoy and the outcomes differentiate accordingly.

The second source of outcome inequality is inequalities that arise from differential effort, choice, and luck of the individual. These factors can be controlled by individuals. They include the choices individuals make such as how hard to work, what kind of lifestyle (healthy or not) to live, where to invest the savings or whether or not to buy the lottery ticket, etc. People with exactly the same choice sets may end up with different outcomes due to their choices, effort, and luck and therefore it is justifiable to hold them accountable for the differences.

Figure 3-1. Decomposition of Outcome Inequality



Source: de Barros et al. (2009)

De Barros et al. (2009) highlight two views within the IOP component of total inequality. The first view requires that individuals with similar efforts and choices should have similar results. This "meritocratic" view may sound reasonable at first since it seems like the outcome solely depends on effort and choice. However, it fails to comply with our definition of EOP because the outcome may be circumstance-dependent. That is, as contended by Arneson (1989) and Cohen (1989), effort and choice may be conditional on the circumstances (this view cancels arrow 1 but not arrow 3 in Figure 3-1). The second view is Roemer's (1998) egalitarian view which necessitates that the outcomes are not influenced by the circumstances. This view directly eliminates the inequality stemming from IOP (arrow 1) and eliminates the effect of circumstances on effort and choice (arrow 3). Roemer contented that EOP requires leveling the playing field before any competition takes place. Meritocracy, on the other hand, implies no discrimination during the competition when all the skills that are necessary for the position are already formed. Roemer's IOP approach implies

equalizing the chances at the period of formation of the skills. De Barros et al. (2009) looked at the case of indigenous people in the labor market to demonstrate the difference. Indigenous people generally value education less since they have lower educational achievements due to language barriers, cultural differences, and the type of school they are attending. This lower educational achievement translates into lower wages for indigenous people. In this case, the meritocratic view implies there is EOP because the income difference is due to the choices made by individuals. Roemer's view, on the other hand, would imply the contrary because the outcome depends on ethnicity. That is, although arrow 1 is shut down in Figure 3-1, circumstances still affect the outcome through arrow 3. Roemer's approach looks for the source of merit and if it roots from circumstances, it is not accepted as a "true" merit. More generally, the perception of discrimination may detain people from investing in themselves. If members of some social group believe that they will be discriminated against in a particular market, they will invest less in skills that are not compensated by the market (World Bank, 2005).

There may be other cases where circumstances influence the outcome through effort and choice (arrow 3 in Figure 3-1). Hoff and Pandey (2006) presented a rather unexpected example of this relation (cited in World Bank, 2005). Hoff and Pandey (2006) conducted three experiments with children from different castes in India. In each of the experiments, children were tasked with solving mazes and were compensated based on the number of mazes completed. In the first experiment, the participant's personal information was not disclosed. In the second experiment, the caste, name, and village of the child were announced. In the first setting, children from different castes perform equally well. However, in the second experiment, children from low caste solved 25% fewer mazes compared to the high caste children. In the third experiment, the children are segregated into two groups according to their caste, name, and village. In this experiment, the low-caste children performed even worse. Accordingly, Hoff and Pandey (2006) concluded that background influences the social identities assigned to social groups and these social identities may affect the behavior (effort in our context) even after opportunities are equalized. Relatedly, the World Bank (2005) stated that "*the behavior of real individuals depends as well on belief*

systems that society impresses on them. Negative stereotypes create anxiety that may interfere with performance."

Moving forward in Figure 3-1, IOP can come from three sources, namely differences in (i) exogenous genetic factors, (ii) discriminatory treatment, and (iii) access to basic goods and services. Initially, different intrinsic and personal characteristics among people such as talent and motivation can lead to IOP (arrow 4). Considering Roemer's EOP definition, given the same degree of effort, the more and less talented individuals should have the same outcomes. The problem with this source of IOP is how much recognition should be assigned to virtue or productivity since inequality among unequally talented individuals is generally accepted as fair by the public. Roemer (1998) acknowledged that including IQ as an element of circumstance leads to inefficiency. He stated that allocating educational resources so that future income is independent of IQ will reduce the aggregate output because higher IQ'ers are more efficient utilizers of educational resources. However, there might be other cases where genetically disadvantaged children need to be subsidized. For example, children with dyslexia can succeed in life if they receive additional teaching support at the early stages of their education. Therefore, whether to level the playing field fully or partially is a social choice and the society may choose not to apply the IOP with full force. Regarding the same issue, de Barros, Vega, and Saavedra (2008) claimed that a demonstration that the values attributed to talent are just is needed. They also contended that it is not just if society values only a few types of virtues that are possessed by only a minority.

Secondly, IOP realizes when equally talented and motivated people are treated differently (arrow 5). This generates differential outcomes for individuals with similar characteristics. This unequal treatment of equals is called discrimination. A well-known example of discrimination is the wage differences between female and male workers.

The third source is the unfair distribution of opportunities among different groups (arrow 6). Basic opportunities have a significant effect on outcomes and their universal provision is generally desirable. Even if their universal provision is not

possible, the EOP rule requires their distribution to be free from circumstances. The differential access to opportunities may be rooted in two sources: differences in social treatment and differences in family resources. The former refers to discrimination of some individuals with certain characteristics. There are two channels through which discrimination can be generated. The first arises when some circumstance groups' access is limited to a basic service such as education or health. Through the second channel, discrimination operates after access to services is granted. In this case, everyone is treated equally when accessing an opportunity but treated differently during the service. For example, a workplace may give equal chances to both male and female workers in the recruitment process but offer them differential wages. This kind of treatment violates EOP because it leads to different outcomes among equally talented and motivated individuals.

Differences in family resources and location may have a remarkable impact on outcomes (arrow 8). In this case circumstance groups may not have equal access to opportunities solely because their families lack necessary resources. An undernourished child may have access to education, but he might not fully develop and utilize his talent. Moreover, children from poor families may have access to education but may not have sufficient educational materials at home which can lead to differential learning outcomes among equal children. Location can also lead to differences in access to basic services. In an urban society, the access to education and health may be lower or the quality of the service might be worse in rural areas.

Ensuring equal access of all children to opportunities is the responsibility of governments. Whenever a child is withheld from quality education, sufficient nutrition, or good health services due to his or her circumstances, the ideal of EOP is violated. Public policy should eliminate any kind of discrimination or inability to benefit from basic services because of insufficient family resources. Governments should aim at universal provision of basic services and if it is not possible then equal access of every social group must be the main concern.

3.1.3 Empirical Studies on Inequality of Opportunity

The application of the EOP principle in real life has two indispensable dimensions: (i) measuring the IOP and (ii) designing public policies in a way to eliminate the available inequalities. Employing the concept of EOP developed by Roemer (1998), the available empirical studies have also focused on these aspects of IOP but in reverse order. That is, the initial group of empirical studies analyzed the design of public policy to equalize opportunities among individuals and the cost of these policy interventions. The more recent group of studies aims to measure the degree of IOP in a society.

3.1.3.1 Studies Focusing on Opportunity Equalizing Public Policies

The work of Page and Roemer (2001) is one of the noteworthy examples of the first group of studies. In their study, Page and Roemer (2001) analyzed the extent the tax and transfer system in the US contributes to EOP in income. Their results revealed that the US fiscal policy was successful in eliminating IOP rooted from socioeconomic characteristics, but it did not perform as well when it came to eliminating IOP across different races. In light of this finding, they concluded an effective compensatory program should be built on race as well as socioeconomic characteristics. They also proposed compensatory education programs as not only effective but also politically acceptable opportunity-equalizing interventions. In a similar study, Roemer et al. (2003) assessed the impact of fiscal policy (the size and incidence of income taxes and transfers) on EOP in 11 developed countries to identify the extent these policies contribute to equalizing opportunities using household surveys and administrative micro-data. They decomposed income inequality into inequality due to circumstances and inequality due to effort and asserted that the EOP principle required inequalities due to circumstances should be compensated. Using parental education as the only circumstance, their analysis revealed that fiscal policies in Northern European countries are optimal from the EOP principle.

Betts and Roemer (2004) studied the opportunity equalizing reallocation of educational expenditure (spending per pupil) for income using the National Longitudinal Survey of Young Men (NLSYM). They defined two circumstances: race

(black/white) and parental education (low/high). They found that equalizing education spending per pupil for each type of student would have little effect on income inequality because race is the dominant contributor to income inequality. To identify the opportunity equalizing intervention, they worked on two scenarios. In the first scenario, the total education expenditure was kept constant. In this scenario, equalizing opportunity between races would require spending 18 times more on black students than on white students. This scenario entailed no additional cost to governments and the disadvantaged workers were estimated to have a 10 percent wage increase. In the second scenario, the total education expenditure was increased such that the average expenditure per pupil was no less than the actual case. In this scenario, Betts and Roemer identified that the per capita educational spending for black students should be nine times as much as for white students. This intervention would increase the weekly wages by 14 percent, but the cost would be as high as $293,000 per black student.

Similar to Betts and Roemer (2004), Waltenberg and Vandenberghe (2007) also investigated educational expenditures in Brazil. However, they focused on test scores as the outcome, not on earning. They used the 2001 wave of Basic Education Assessment System which assesses the cognitive abilities in Portuguese and mathematics of pupils aged 14. Utilizing the mother's education as the only circumstance, they asserted that achieving EOP requires spending 6.8 times more on the lowest achieving pupils than the actual spending.

Pignataro (2012) highlighted two limitations of the previously mentioned literature that analyses the opportunity equalizing policy interventions. First, they stated that the correlation between public policy and outcomes (earnings, test scores) does not guarantee that the policy solely determines the outcome. Second, they identified a possible endogeneity problem because of the *"conditional association and the simultaneous determination of policy and outcome*".

3.1.3.2 Studies Focusing on the Measurement of the IOP

As previously highlighted, the second group of empirical studies focuses on measuring the IOP. These studies can also be grouped into two categories. The first

category of studies under this branch attempts to measure the contribution of IOP to total inequality in different outcome variables such as earnings, income, education, or health. The second category of studies makes an effort to measure the level, change, and sources of IOP in terms of access to opportunities using an index named the Human Opportunity Index. Significant examples of this branch of literature are given in the following parts of the study.

3.1.3.2.1 Studies Measuring the Share of IOP in Total Inequality

As explained in Section 3.1.2, inequality in an outcome such as income stems from two sources: inequality due to circumstances (i.e., IOP) and inequality due to effort. The measurement strategy of the studies discussed part of the study relies on decomposing the total inequality into these two sources. The methodology applied in these studies is elaborated in the below Box.

Box 1. The methodology of measuring the share of IOP[6]

Following Roemer's rule (Roemer, 1998), the measurement strategy requires partitioning the population into types (or circumstance groups), i.e., subpopulations with the same circumstances. This partition enables to differentiate between within-group inequality and between-group inequality. The between-group inequality reflects the IOP because it reflects the differences in outcomes of individuals with different circumstances. The within-group inequality, on the other hand, indicates the inequality due to effort since individuals in each type share the same circumstances and the differences in outcome are merely due to effort.

$$Total\ inequality = Inequality\ due\ to\ effort + inequality\ of\ opportunity$$

$$Total\ inequality = Inequality\ within\ types + inequality\ between\ types$$

The estimation of within and between types inequality can be conducted in several ways depending on (i) the inequality index used (ii) the path of decomposition (direct or indirect) and (iii) the procedure of decomposition (parametric or non-parametric) (Assaad et al., 2012).

i. The inequality index used

The first step is selecting an inequality index (represented by "I") that can be decomposed into within-group (type) and between-group inequalities. Among many possible indices, the most widely used ones are the general entropy (GE) indices developed by Shorrocks (1980) and the well-known Gini coefficient. The GE indices are represented as follows:

[6] This box provides a summary of the methodology discussions in Pignataro (2012) and Assaad et al. (2012)

$$GE(\alpha) = \begin{cases} \frac{1}{N\alpha(\alpha-1)}\sum_{i=1}^{N}\left[\left(\frac{y_i}{\bar{y}}\right)^{\alpha}-1\right] & for\ \alpha \neq 0,1 \\ \frac{1}{N}\sum_{i=1}^{N}\frac{y^i}{\bar{y}}\ ln\frac{y^i}{\bar{y}} & for\ \alpha = 1 \\ -\frac{1}{N}\sum_{i=1}^{N} ln\frac{y^i}{\bar{y}} & for\ \alpha = 0 \end{cases}$$

Where N is the number of cases, y is the distribution of the discrete outcome of interest, y_i is the outcome of i[th] case, $\bar{y}$ is the mean value of the outcome and α is a parameter of weight assigned to different parts of outcome distribution. The value of α decides to which side (lower or upper end) of distribution is given more weight. There are some special cases of GE indices that are widely used. GE(0) is called *mean log deviation* or *Theil's L* index and it is more sensitive to differences at the lower end of the distribution. GE(1) is referred to as *Theil's T* index and it is more sensitive to the upper end of the distribution. GE(2) or half the squared coefficient of variation is another special case of GE indices. GE(2) assigns even more weight to the higher end of the distribution.

ii. The path of decomposition

The share of IOP can be directly or indirectly measured. The direct approach eliminates the within-type inequality and measures IOP directly. However, the indirect approach surpasses the between-type inequality and measures IOP indirectly by subtracting the within-types inequality from total inequality.

The direct approach uses a smoothed distribution of an outcome. This smoothed distribution is obtained by substituting the outcome of each individual i in type j (y_i^j) by the mean of that type (μ_i^j)[7]. This substitution generates types in which each individual in a type has the same outcome (μ^j). Since the between-type inequality is eliminated, the inequality in this smoothed distribution is the IOP.

The indirect approach surpasses the between-type inequality using a standardized distribution. This standardization is made by substituting y_i^j (for all i and j) with $v_i^j = y_i^j \frac{\mu}{\mu_i^j}$. This substitution produces types all of which have the same mean, hence all the remaining inequality in this distribution is within-type inequality. The difference between the inequality in initial and standardized distribution gives the IOP.

The inequality share in direct and indirect approaches is denoted by θ_d and θ_r respectively and expressed mathematically as follows:

$$\theta^d = \frac{I\{\mu_i^j\}}{I\{y\}} \qquad (2.1)$$

$$\theta^r = 1 - \frac{I\{v\}}{I\{y\}} \qquad (2.2)$$

[7] Here note that $\mu_i^j = \mu_k^j$ for all i and k.

Where $I\{y\}$, $I\{\mu_i^j\}$ and $I\{v\}$ denote the inequality in initial, smoothed and standardized distribution respectively.

iii. The procedure of decomposition

The decomposition can be conducted by utilizing parametric and non-parametric methods. The parametric decomposition assumes a functional form on how the outcome (y) relates to the vector of circumstances (C). The non-parametric method, on the other hand, does not require any assumption but necessitates larger data sets. There are two non-parametric decomposition procedures, namely decomposition by type and decomposition by tranche.

The parametric estimation procedure

The parametric estimation procedure is developed by Bourguignon et al. (2007) and it can be conducted directly (by using the smoothed distribution) or indirectly (by using standardized distribution). Let the general functional form of how the outcome (y) depends on circumstances (C) and effort (E) be:

$$y = f[C, E(C, v), u] \quad (2.3)$$

Note here that effort is also a function of circumstances and *v* and *u* are error terms. The same relation can also be written in a reduced form[8] as:

$$y = \emptyset[C, \epsilon] \quad (2.4)$$

$$\ln y = \psi C + \epsilon \quad (2.5)$$

Assuming a suitable form (linear or log-linear generally) for the reduced function (in 2.4), the parameters in the equation (2.5) ($\hat{\psi}$) can be obtained using OLS. Then, the parametrically smoothed distribution can be constructed by substituting y_i with $\hat{z}_i = \exp(\hat{\psi} C_i)$ for all i. This substitution replaces the original value of y_i with the predicted value. Hence, everyone sharing the same type will have the same value of $\hat{z}$. This eliminates the within-type inequality and the remaining inequality (IOP) van be computed as in (2.1).

The standardized distribution can be obtained by replacing y_i with $v_i = \exp(\hat{\psi}\bar{C} + \hat{\varepsilon}_i)$ where $\bar{C}$ is the vector of mean value of circumstances and $\hat{\varepsilon}_i$ is the predicted error terms. In this new distribution, everyone shares the same circumstances ($\bar{C}$). Therefore, the IOP is eliminated and all the remaining inequality is within-type inequality. Then the share of IOP can be computed indirectly as in (2.2).

The non-parametric estimation procedure

The non-parametric decomposition of total inequality can be conducted in two ways: by types and by tranches[9]. The main difference between these two procedures lies on how they view IOP. According to by types approach, the IOP is the inequality between types. In this approach,

[8] Here, both direct and indirect effect (through effort shown by Arrow 3 in Figure 3-1) of circumstances on outcome is captured by the parameters ψ of the function ∅. See Ferreira and Gignoux (2011) p.13 for more details.

[9] These procedures are also named as ex-ante decomposition and ex-post decomposition respectively.

the distribution of effort does not need to be observed and the IOP is computed using the smoothed and standardized distribution approach discussed in section ii (t*he path of decomposition)*[10].

In the by tranches (ex-post) approach developed by Checchi and Peragine (2010), on the other hand, IOP is defined as the inequality among individuals exerting same degree effort across types. This approach first utilizes types and then defines tranches as group individual who are at the same percentile of effort distribution across types. After this additional grouping, the inequality within-tranches reflects the IOP and the inequality between tranches indicates the inequality due to differences in effort.

Once the tranches are constructed, the smoothed and standardized distribution can be obtained easily by substituting $y_i^{e,j}$ [11] with μ_i^e [12] and $v_i^{e,j} = \frac{\mu}{\mu_e} y_i^{e,j}$ respectively.Then, the share of inequality is computed directly and indirectly by

$$\theta^d_{tranches} = \frac{I\{\mu_i^e\}}{I\{y\}} \qquad (2.5)$$

$$\theta^r_{tranches}$$

Bourguignon et al. (2007) are among the pioneer studies[13] that decomposed the income differentials into IOP and inequality due to accountable effort[14] and luck. They develop a measure of inequality that compares the actual earnings with the counterfactual earnings when the differences in circumstances are removed. Their methodology utilizes the direct and indirect decomposition paths using the parametric procedure and the inequality indices are Theil and Gini. Using this methodology on the National Household Survey for 1996 in Brazil, they find that between 10 and 37 percent of differences in earnings are attributable to five circumstances, namely race, place of birth, father's occupation and parental education.

In their cross-country study, Lefranc et al. (2008) attempt to compare the degree of IOP in nine developed countries in the early 1990s and analyze the relationship between inequality of income and opportunity. They use non-parametric

[10] By replacing y_i^j with μ^j and v_i^j and computing θ^d and θ^r respectively.

[11] $y_i^{e,j}$ stands for the outcome of individual i at type j and tranches e.

[12] Mean value of outcome y within tranche "e"

[13] To our knowledge, it is the first study of this kind published in a journal if the working papers are excluded.

[14] They referred to the share of effort that is not influenced by the circumstances

stochastic dominance tests to rank countries in terms of the level of IOP[15]. They also developed a Gini Opportunity Index to be able to analyze the relationship between income and opportunity inequality. The data source is household surveys conducted in each country. The outcome variable was income and the circumstances were selected as the father's education for Belgium, West Germany, Italy, Netherlands, Norway, Sweden, USA and the father's occupation for France, and Great Britain. The analysis results reveal three country groups in terms of level of inequality. The group with the highest level of inequality consists of Italy and the USA. The second group with an intermediate level of inequality consists of Belgium, France, Great Britain, and the Netherlands. West Germany, Sweden, and Norway constitute the group with the lowest inequality. The results also suggest a strong positive correlation between income inequality and IOP (the correlation coefficient was 0.674).

Utilizing the decomposition approach developed by Bourguignon et al. (2007), Pistolesi (2009) investigates the IOP component of earning inequality in the USA from 1968 to 2001. Pistolesi uses direct and indirect decomposition paths, a semi-parametric estimation approach, and multiple inequality indices (including GE family and Gini) to decompose inequality. The data source is the Panel Study of Income Dynamics (PSID) from 1968 to 2001. In the analysis, the outcome variable is annual earnings. The circumstances are selected as age, parental education, father's occupation, and race. The analysis reveals that on average between 20 percent and 43 percent[16] of total earning[17] inequality is due to IOP from 1968 to 2001. However, the share of IOP decreased to 18 percent in 2011[18].

Cogneau and Gignoux (2009) examine the level and trend of IOP and its relation to earnings inequality in Brazil from 1976 to 1996. Utilizing the Pesquisa Nacional por Amostra de Domicilios (PNAD) surveys from 1976, 1982, 1988, and 1996, they decompose the IOP component in (hourly) earnings inequality using the

[15] This method is not discussed in Box 1. It relies on comparing cumulative distribution functions of the outcome conditional on the set of circumstances.
[16] The different values are due to different measurement techniques used in the analysis. The results are 27 percent for Theil, 28.4 percent for mean logarithmic deviation, 20.1 percent for half squared coefficient of variation, 43 percent for standard deviation of logs and 35.5 percent for Gini.
[17] Five years average earnings.
[18] See Pistolesi (2009) for the possible interpretations of this fall.

following circumstance variables: father's education and occupation, place of birth, race[19]. Their analysis[20] reveals that the contribution of circumstances to total inequality was nearly 30 percent over time. The Gini and Theil Indices generated for both inequality of earnings and outcome indicate that both inequalities display a very similar path, increasing sharply from 1979 to 1988 followed by a decrease in 1996. The only difference is that the inequality in 1996 was higher than the initial level (1976 level) in earnings but it is lower than the initial level for IOP.

Barros et al. (2009) estimate the share of IOP in several Latin America and Caribbean Countries[21]. The outcome variables are earnings, per capita income, and consumption for adults, and educational achievement for 15-year-old children. For earning, income, and consumption outcomes, the data sources are seven national household surveys. The circumstances are gender, race (ethnicity), type of area of birth, parental education, and father's occupation for earning, income, and consumption. They revealed that between 20 (Colombia) and 35 (Brazil) percent of the total inequality in individual earnings could be attributed to IOP. The same figures for income and consumption per capita range between 21 (Mexico) and 37 (Guatemala) percent and between 26 (Colombia) and 52 (Guatemala) percent respectively. As for educational achievement, their analysis covers 5 LAC Countries and the data source is the PISA 2000. Using five circumstances and applying the same methodology, the results indicate that between 22 (Brazil) and 28 (Argentina) percent of total inequality in reading and between 17 (Peru) and 29 (Argentina) percent of total inequality in mathematics is due to IOP. For all outcome variables, the family background variables have the highest impact on total inequality.

Checchi and Peragine (2010) have also studied the IOP component in individual earnings in Italy. They use the direct and indirect decomposition, non-

[19] They used semi-parametric estimation procedure and Theil and Gini Indices.
[20] The analysis was run on a sample restricted to men aged 40-49.
[21] Brazil, Colombia, Ecuador, Guatemala, Mexico, Panama and Peru for earning, income and consumption. Argentina, Brasil, Chile, Mexico and Peru for educational achievement.

parametric by types[22] and by tranches[23] estimation procedure, and mean log deviation (GE(0)) index to decompose total inequality. The data sources are 1993, 1995, 1998, and 2000 waves of the Survey on Income and Wealth of Italian Households and they utilized only one circumstance namely parental education (the highest educational attainment of parents) in their analysis. Using the by-tranches approach, they find that 19.5 percent of the total inequality is rooted from IOP for the entire population in Italy[24]. Their regional analysis reveals that although the total inequality is higher in Centre-South Italy, the contribution of IOP is more pronounced in north Italy (18.0 percent in North vs. 16.6 percent in Centre-South). They also assert that the contribution of IOP is higher at the extremes (lower and higher quintiles) of earning distribution. The by-types estimation procedure produces lower results. The contribution of IOP to inequality was found to be 14.78, 14.47, and 12.36 percent for the entire population, North and South-Centre respectively.

Checchi et al. (2010) analyze the fair and unfair components of income inequality in 25 European countries. The data source is the 2005 wave of the European Survey on Income and Living Conditions (EU-SILC). The outcome variable is individual earnings after tax and the circumstances are parental education and occupation, gender, nationality, and geographical location. The analysis is conducted on a sample of individuals making positive income and aged between 30 and 60. Using both parametric and non-parametric methods and tranches and types approach, they show that the share of IOP in total income equality ranges from 2.5 percent to 30 percent and from 16 percent to 45 percent for types and tranches approaches respectively. Furthermore, they identify three groups of countries namely i) formerly centrally planned economies that exhibit high-income inequality but a moderate level of IOP (Poland, Lithuania, Latvia, and Estonia plus Portugal), ii) continental Europe countries that exert an intermediate level of income inequality but high IOP and iii)

[22] The approach is based on the idea that the inequality within types is the result of effort and the inequality between types is due to IOP (ex ante approach).
[23] The approach employs the idea that the degree of effort is the same at each income percentile of different types (tranches), therefore the earning inequality among individuals at the same degree of effort is due to differences in opportunity (ex post approach).
[24] All the analysis in the study was based on a sample of observations with positive earnings.

Scandinavian countries plus Slovenia and the Slovak Republic which have achieved low levels of total and opportunity inequality.

Zhang and Eriksson (2010) analyze the IOP trends in China where income inequality has risen from relatively low levels (0.32 in 1978) to internationally high levels (0.50 in 2006). They use the methodology developed by Bourguignon et al. (2007) to measure IOP in nine Chinese provinces[25]. The data source is the China Health and Nutrition Survey (CHNS). The outcome variable is income. The circumstances are parental income, parental occupation and education, parental household size, birth region, gender, and age of the individual. Their analysis indicates that the share of IOP in total income inequality is very high and rising over time. Specifically, they calculate the share of inequality as 46, 49, 48, 57, 65, and 63 percent in the years 1989, 1991, 1993, 1997, 2000, 2004, and 2006 respectively. Considering that this increase in EOP coincides with the rise in income inequality, they highlight that this trend indicates an even worse deterioration in opportunities. The parental income and the occupation of the father and mother were responsible for 62 percent of the total opportunity inequality. Noting this fact, Zhang and Eriksson (2010) state that *"parental connections remain an important transmission mechanism for the intergenerational persistence of economic advantage and disadvantage."*

Ferreira and Gignoux (2011) attempt to measure the IOP in six Latin American Countries using the methodologies developed by Bourguignon et al. (2007) and Checchi and Peragine (2010)[26]. The data source is nationally representative household surveys. Their outcome variables are household per capita income, and per capita consumption, and the circumstances are selected as family background variables, place of birth, and race. Restricting their sample to individuals aged between 30 and 49, they find that IOP accounts for between 25 percent (Colombia) and 36 percent (Guatemala) of the total inequality in per capita income and between 27 percent (Colombia) and 53 percent (Guatemala) of total inequality in per capita consumption using non-

[25] They used direct decomposition path, parametric estimation procedure and Gini index..
[26] They perform both direct and indirect decomposition approaches and parametric and non-parametric (by types) estimation procedures. They use mean log deviation (GE(0)) as the inequality index.

parametric techniques. The parametric approach produced slightly smaller estimates. The authors also analyze the contribution of each circumstance to total IOP. The results show that the family background variables contribute to inequality the most. Furthermore, they show that being a member of an ethnic minority and being a child of an agricultural worker is strongly associated with opportunity deprivation. The results also reveal that opportunity deprivation had a spatial dimension since many of the disadvantaged groups were concentrated in certain regions in each country.

Ferreira et al. (2011) investigate the IOP component in wealth and consumption in Türkiye. Their data source is the Turkey Demographic and Health Survey (TDHS) 2003 and the Household Budget Survey (HBS) 2003. The first outcome variable is the wealth index which is constructed by authors using information on ownership of durable goods, housing conditions, and access to basic services. Since TDHS 2003 does not contain data on consumption, the second outcome variable (consumption) is generated by combining the circumstances from TDHS with the consumption variable from HBS 2003. The selected circumstances are type of area of birth (rural/urban), region of birth, parental education, mother tongue, and number of siblings. Based on a sample of ever-married women aged between 30 and 49, the authors employ direct decomposition using both parametric and non-parametric procedures and variance and MLD as the inequality indices[27]. The analysis indicates that the IOP accounts at least for 31 percent of wealth inequality and 26 percent of consumption inequality[28]. The most important circumstances are the type of birthplace and parental education. The authors have also constructed the opportunity profiles to identify the most and least advantaged groups. Defining the most and least advantage groups as the women in the top and bottom decile of consumption distribution, they find that 99 percent of the women in the most advantaged group were born in urban whereas the same figure is only 12 percent for the least advantaged women. Similarly, the most common birth region is east (96 percent) for the bottom decile. However, only 5 percent of women born in the east were in the top decile. Moreover, the share of women with parents

[27] Since the wealth index has zero mean by construction, the GE family inequality indices are not suitable. Therefore, variance is used instead.
[28] The parametric estimates are reported. The same figures are 36 and 32 percent for non-parametric estimation procedure.

without a diploma (or illiterate) is 97 percent (mother's education) and 84 percent (father's education) in the bottom decile. The same figures are around 3 percent in the top decile. As for mother tongue, 99 percent and 3 percent of women in the top and bottom deciles respectively declared their mother tongue as Turkish.

In their inspiring study, Björklund et al., (2012) analyze the IOP component of income inequality in Sweden which is widely accepted as one of the most equal countries in the world. In all the previous studies investigated so far, the level of EOP is referred to as a lower bound since the number of circumstances that can be included in the analysis is limited due to data availability. Using a rich longitudinal data set that included more than one-third of the total male population, this study utilizes 6 circumstances and 1,152 types. Therefore, the measured level of inequality should be close to the actual level of inequality. The study measures IOP using the direct decomposition approach, parametric estimation procedure[29] and the following inequality measures: Gini, GE(0), GE(1) and GE(2). The data source is several Swedish administrative register data sets[30]. The outcome variable is total market income before taxes. The circumstances are parental income, parental education, family type, number of siblings, IQ quartile, and body mass index. The analysis is based on a sample restricted to male individuals born between 1955 and 1967. The results reveal that between 13.1 and 41.1 percent[31] of the income inequality is due to differences in circumstances. Furthermore, the IOP faced by the 1963-1967 cohort was higher than that of the 1955-1959 cohort. The most important circumstances were parental income and IQ. The measurement methodology used in the study also allowed for distinguishing between direct and indirect contribution of circumstances to inequality. Accordingly, between 3.5 and 23.1[32] percentage points of inequality of income is due to the impact of circumstances on effort (indirect, see Arrow 3 in Figure 3-1). These results are significant in terms of displaying how high the IOP can be even

[29] Their methodology is a modified version of parametric approach developed by Bourguignon et al. (2007) where the authors assumed that each type has its own distribution of effort. Hence the effect of circumstances on effort is not uniform across types.
[30] The registration systems are Multi-generational register, bidecennial censuses, Statistic Sweden's income register, Swedish Military Enlistment Battery
[31] The results differ according to the index used. Gini coeficient: 28.2, log mean deviation: 13.1, Theil: 20.7 and squared coefficient of variation: 41.1.
[32] Gini coeficient: 5.9, log mean deviation: 3.5, Theil: 8.9 and squared coefficient of variation: 23.1.

in one of the equal countries in the world if more circumstances (and more types) are included in the analysis. However, this result should also be interpreted with caution because the outcome variable is before tax income and the inequality can be lower after taxes are imposed. After all, the tax systems in northern European countries are known to be successful in reducing inequality as shown by Roemer et al. (2003).

Singh (2012b) measures the IOP in India using both the non-parametric and the parametric approach[33]. The data source is the India Human Development Survey (IHDS) 2004–05. Two outcome variables are investigated in the study, namely per capita earning, and per capita consumption expenditure. The circumstances are the father's education for the non-parametric approach and father's education, father's occupation, caste, religion, and geographical region of residence for the parametric approach. The results[34] based on the non-parametric approach show that between 11.0 and 18.5[35] percent of the earning inequality is due to the father's education level in urban areas. The same figures for the rural areas are between 5.2 and 8.4 percent. As for per capita consumption expenditure, the figures are not far from those of earnings. Using the parametric approach, they find that between 18.3 and 25.6 percent of earning inequality is due to IOP in urban areas. For rural areas, the share of opportunity inequality is ranging from 16.0 to 20.8 percent. For consumption expenditure, the IOP is responsible for between 16.0 and 24.5 percent and 19.7 and 23.2 percent of the total inequality in urban and rural respectively. The results reveal that there is an urban/rural divide in terms of IOP faced by individuals. This divide is more pronounced for the non-parametric approach. The only exception to this is the IOP within consumption in which the results do not change significantly between urban and rural areas. Furthermore, the IOP is highest for the 21-30 cohort and lowest for the 41-50 and 51-65 cohorts. Another finding is that there is a big gap between the results of the two approaches. This is mainly because there is only one circumstance in the non-

[33] Regarding the non-parametric estimation procedure, they consulted only the by types approach. The inequality index used in the study is GE(0)

[34] All the analysis in the study were run on sample restricted to males in the age group 21–65 years.

[35] A range of results is given because the results were reported for four cohorts separately: 21-30, 31-40, 41-50 and 51-65 years of age.

parametric approach due to data unavailability. The most important circumstance is father's education for urban and religion for rural for both earning and consumption.

In a recent study, Suárez Álvarez and López Menéndez (2018) assess the IOP trends in Spain. They decomposed the total inequality by using the direct decomposition path, parametric and non-parametric estimation procedures, and GE(0) as the inequality index[36]. The data source is the 2004 and 2010[37] waves of the EU-SILC. The outcome variable is equalized disposable income, and the circumstances are gender, immigration status, parental education, population density, and region. Their analysis displays that the IOP is responsible for 15 and 21 percent of total income inequality in Spain for 2004 and 2010 respectively. They also find that the circumstances' indirect[38] contribution to inequality is significantly lower than the direct contribution. That is, only 0.4 (1.8) percentage points of the total IOP share stemmed from the indirect effect in 2004 (2010). Decomposing the IOP, they highlight that parental education (in 2004) and immigration status (in 2010) generated more than half of the total IOP in both periods. On the other hand, gender has an insignificant contribution (less than 1 percent) to IOP in both years.

Ferreira and Gignoux (2010) attempt to measure the IOP in education quality in Türkiye. They use the parametric estimation procedure. Their data come from the 2006 wave of the PISA. However, since the PISA data represent only 47 percent of the population of interest in Türkiye, the authors apply a non-parametric two-sample reweighting technique on the 2006 Household Budget Survey (HBS) to generate two alternative distributions to correct the selection bias. The first alternative (low alternative) assumes the distribution of test scores within each circumstance group is identical for participants and non-participants. The second alternative (high alternative) assigns the lowest test score attained in each circumstance group to every non-participant in that circumstance group. The outcome variables are the test scores in reading, math, and science. The circumstances are gender, parental education,

[36] They use both of the parametric estimation procedures developed by Bourguignon et al.(2007) and Björklund et al.(2012).
[37] These dates show the year when the data was gathered and the actual waves of survey are EU-SILC 2005 and EU-SILC 2011.
[38] See arrow 3 in Figure 3-1.

father's occupation, region and area of residence, number of books at home, wealth (ownership of durable goods), and cultural possessions[39]. The results show that around 26, 28, and 32 percent of total inequality in test scores is due to circumstances for no-correction, low alternative, and high alternative scenarios respectively. Furthermore, these circumstance shares did not deviate from each other for all the 3 subjects (i.e., reading, math, and science). However, the significance of individual circumstances in total inequality differs by the subject. For reading, cultural possessions, gender and number of books are the most important circumstances, where around 54 percent of total IOP comes from these 3 circumstances. For math, the number of books, wealth, and father's education accounted for more than half of the IOP. For science, 56 percent of the total opportunity inequality stems from the number of books and father's education.

Asadullah and Yalonetzky, (2012) analyze the inequality of educational opportunity in India. They use four indexes[40] to compare the change in educational opportunities from 1983 to 2004. The data come from the 1983 and 2004 waves of the National Sample Survey (NSS). The outcome variable is the school completion rate and the selected circumstances are gender and religion (Hindu vs non-Hindu). All the analyses are run on a sample restricted to adults aged 25 or more in 25 states of India. Their results display progress at the national level with significant variation across states. The states that experienced the largest improvements are those that have more accountable governments and that provide more opportunities such as access to finance, and labor force participation) especially of women) to their citizens. Not surprisingly, the results also show a negative association between the level of education and IOP. That is, states with higher levels of completion rate have also lower IOP. Furthermore, the authors found a strong positive correlation between poverty and IOP.

Salehi-Isfahani et al. (2014) measured the IOP in education in 16 Middle East and North African (MENA) countries. They use direct and indirect decomposition

[39] Ownership of books on poetry, music or art, works of art or musical instrument etc.
[40] These indices are the Pearson-Cramer Index, the Overlap Index and two versions of the Reardon Indices

methodologies, parametric estimation procedures, and GE(2) as the inequality index. The outcome is test scores in mathematics and science. The data source is the Trends in Mathematics and Science Study (TIMSS) waves 1999, 2003 and 2007[41]. The circumstances are gender, family background variables, ethnicity, and community characteristics (size of the settlement, average class size, characteristics of the teacher, and share of economically disadvantaged students). The results indicate that the IOP is high and diverse in the region ranging from 4.6 percent (in Algeria) to 34 percent (in Türkiye) in mathematics and from 4.4 percent (in Algeria) to 38.7 percent (in Qatar) in 2007. In most of the countries, the share of family background variables in total IOP is higher than that of community characteristics. However, this is more pronounced in high IOP countries. Furthermore, the authors show that gender as a circumstance does not contribute to IOP meaning that girls and boys did equally well in the test[42]. The trend in IOP over time displays that the IOP has increased in four of the five countries that participated in both the 1999 and 2007 waves of TIMMS. Finally, the analysis revealed that there is a weak relation between inequality of scores and opportunity.

Salehi-Isfahani et al. (2014) also analyzed EOP in Türkiye. Therefore, the analysis results for Türkiye deserve further elaboration. Türkiye participated in the 1999 and 2007 waves of TIMMS and students from Türkiye did comparatively well in both studies. However, Türkiye exhibited no improvement in test scores from 1999 to 2007. The share of IOP in inequality of scores was 12.8 (for math) and 11.5 (for science) percent in 1999 and 34.0 (in math) and 31.1 (in science) percent in 2007. Accordingly, Türkiye was the least unequal country in 1999 but over time the IOP increased more than two-fold and became one of the most unequal countries in 2007. The family background is the major source of IOP. Its contribution is more than two times higher than that of community characteristics. Girls and boys from Türkiye did equally well in the test therefore gender is found to have limited contribution to IOP.

[41] The number of MENA countries participated in 1999, 2003 and 2007 waves are 5,10 and 16 respectively. Hence, comparison over time is not possible for every country.
[42] Gender is found to be contributing to IOP in Gulf countries because girls were doing better than boys on average.

Similar to Salehi-Isfahani et al. (2014), Tansel (2015) also investigates the opportunity component in the inequality of educational achievement in Türkiye. She uses four waves (2003, 2006, 2009, and 2012) of PISA to identify the IOP in mathematics, science, and reading scores of Turkish students at age 15. The circumstances are gender, parental education, father's occupation, region, migration status, possession of books, and house amenities. Employing the direct decomposition method, parametric estimation procedures, and variance as the inequality index, she shows that the circumstances are responsible for 32, 26, 22, and 21 percent[43] of the total inequality in 2003, 2006, 2009, and 2012 respectively. Tansel has also identified the family background variables as the most important circumstances in terms of their contribution to inequality.

Golley and Kong (2018) investigate the EOP in education in China. They use direct and indirect decomposition paths, parametric estimation procedures, and the half-squared coefficient of variation index (GE(2)) to measure the share of IOP. The data source is the 2012 wave of the China Family Panel Studies (CFPS) to measure the share of IOP. The outcome variable is years of schooling and the circumstances are father's education, hukou status[44], parents' Communist Party membership, number of siblings, ethnicity, gender, and region. They find the contribution of circumstance to the total inequality as 39.3 percent[45]. They also compute the IOP for different birth cohorts (for every 5 years between 1940 and 1989) and assert that the IOP faced by the 1980-84 cohort is highest (43.1 percent) and it is lowest for the 1945-49 cohort (24.5 percent). Furthermore, they highlight that the hukou status and the father's education are the most important circumstances.

Rosa Dias (2009) studied the IOP component within health inequality in the United Kingdom. In the analysis, he uses the relation between the health pseudo-Gini coefficient and indirectly standardized pseudo-Gini coefficient to measure the share of IOP. The outcome variable is self-assessed health (SAH). The circumstances are

[43] The figures reflect the average of the inequality shares in mathematics, science and reading. Since the inequality shares are very close to each other, they are not reported separately.
[44] Hukou is a household registration system which assigns urban or rural status to citizens and the status obtained from the system leads to different opportunities and rights (education, health care etc.).
[45] This figure is for direct approach. The same figure for the indirect approach is 33.4 percent.

parental socioeconomic background (such as financial status during childhood, parental education, etc.) and congenital and childhood health conditions (including birthweight, smoking behavior of the mother, and breastfeeding status of the child, etc.). The effort variables are smoking behavior, alcohol consumption, fried food consumption, and education level of the individual. The data come from the UK National Child Development Study (NCDS) (waves 1981, 1991, 1999 and 2004). The results display that between 21.5 and 26.4 percent[46] of total health inequality stemmed from the circumstances. Considering the level of IOP, Rosa Dias highlighted that *"at least 21% of the health inequalities observed in adulthood are due to factors that are only amenable to policy interventions early in life.*"

Trannoy et al., (2009) analyze the IOP component of SAH in France. They use three types of methodologies, namely (i) stochastic dominance at first order to identify the best set of circumstances[47], (ii) regression analysis to assess the channels that circumstances affect health, and (iii) counterfactual analysis to reveal the share of IOP. The circumstances are parental education, parental occupation, and relative longevity of parents[48]. The effort variables are the education and occupation of the respondent. The data source is the 2004 Survey on Health, Aging, and Retirement in Europe (SHARE). The first type of analysis indicates that the individuals whose parents are alive have better SAH than individuals whose parents have passed away. Similarly, individuals whose parents had better jobs are found to be more likely to report better health. The second type of analysis reveals that the mother's socioeconomic status has a direct impact on an individual's reported health condition. However, the father's socioeconomic status has an indirect effect on health, that is, it improves SAH through improving daughters'/sons' social status. Finally, the counterfactual analysis shows that if every individual in the sample had the best circumstances, then the Gini coefficient for SAH would be 57 percent lower.

[46] The value changes within this range for four different waves of the study.
[47] The circumstances in this analysis are relative life longevity of parents (family background) and occupation of parents (social background). The analysis aims to identify the most (less) advantageous family and social backgrounds in terms of health.
[48] This indicator compares the actual number of years lived by parents after age 20 with the life expectancy at birth at 20 of the corresponding age cohort.

Assaad et al. (2012) analyze the level and change in IOP in the health of children under 5 years old in Egypt, Jordan, Morocco, and Türkiye. Since children of age under 5 cannot make an effort regarding their health status, total inequality cannot be decomposed into inequality due to effort and circumstances in this context. Therefore, the authors defined IOP as the differences in health status being independent of circumstances and they attributed the remaining inequality to genetic factors and luck which they assume to be an acceptable source of inequality. The outcome variable is height-for-age and weight-for-height. However, they use standardized versions of height and weight variables be able to compare children of different ages and sexes. The circumstances are parental education, region, urban/rural residence, wealth, mother's age at birth, multiple births or not, birth order, and sex of the child[49]. Their data source is the Demographic Health Survey (DHS)[50]. They first look into total inequality and find that the total inequality is highest for Morocco, followed by Egypt, Türkiye and Jordan for height (for age). The ranking is Morocco, Egypt, Jordan, and Türkiye for weight for height. Secondly, they study the contribution of IOP to total inequality using parametric decomposition methods[51]. Their analysis reveals that the IOP is highest in Türkiye (around 15 percent) followed by Jordan (6 percent), Morocco (5 percent), and Egypt (4 percent) for height for age. The ranking for weight for height is Egypt (8 percent), Morocco (3 percent), Türkiye (2 percent), and Jordan (1 percent). Thirdly, they analyze the change in IOP over time and reveal that it remained stable in Jordon, first increased then decreased in Morocco, steadily decreased in Türkiye, and fluctuated in Egypt for height for age. For weight, the IOP decreased in Türkiye and Morocco, remained stable in Jordan, and fluctuated highly in Egypt. Fourthly, the authors examine the contribution of individual circumstances to IOP. Region and urban-rural were found to be the most important circumstances

[49] They also used access to clean water and sanitation, mother's height and BMI, parental occupation as additional circumstance variables for certain type of analysis.

[50] 1988, 1992, 1995, 2000, 2003, 2005 and 2008 waves for Egypt, 1990, 1997, 2002, 2007 and 2009 waves for Jordan, 1987, 1992 and 2004 waves for Morocco and 1993, 1998 and 2003 waves for Türkiye

[51] They use both direct and indirect decomposition paths, parametric estimation procedure and GE(1).

followed by the demographic characteristics (sex of the child, birth order, age of mother etc.) for both outcomes of interest.

Jusot et al. (2013) investigate the share of IOP in health inequality in France by decomposing the variance of health status. They measure the contribution of circumstances (IOP), effort, and demographics to total variance. The outcome variable is SAH. The circumstances are selected to be parents' socioeconomic status (measured by education level and occupation of both parents), parents' health status (, parents' lifestyles (measured by smoking behavior and alcohol consumption of parents when the respondent was at age 12) and family financial status (measured by the self-assessment of economic condition of the individual). The effort variables are smoking, obesity, and vegetable consumption. The demographic variables are age and sex. The data source is the 2006 wave of The French Health, Health Care and Insurance Survey. Their analysis reveals that the share of IOP in total health inequality is between 44.5 and 46.4 percent[52]. In other words, nearly half of the inequality in health status in France is due to the circumstances over which individuals do not have any control. The remaining inequality is due to effort (between 6.1 and 8.1 percent) and demographics (around 47,5 percent).

All of the studies investigated in this section are summarized in Table 3-1.

Table 3-1. Summary of the studies that measure the share of IOP

Study	Country	Outcome	Circumstances	IoP (%)	Methodology
Bourguignon et al. (2007)	Brazil	Earning	"race, place of birth, father's occupation and parental education"	10-37	direct/indirect, parametric, Theils/Gini
Lefranc et al. (2008)	9 developed countries	Income	"father's education, father's occupation"		stochastic dominance, Gini Opportunity Index
Pistolesi (2009)	USA	Earning	"age, parental education, father's occupation and race"	20-43	direct/indirect, semi-parametric, GE(0)/GE(1)/ GE(2)
Cogneau and Gignoux (2009)	Brazil	Earning	"father's education and occupation, place of birth, race"	30	semi-parametric, Theils/Gini

[52] Since the authors used three different views regarding how to handle the relation between circumstances and effort, there is a range of results.

Study	Country	Outcome	Circumstances	IoP (%)	Methodology
Barros et al. (2009)	7 LAC countries (5 for education)	Earning, income, consumption, education (achievement)	"gender, race, type of area of birth (school), parental education, father's occupation"	20-35, 21-37, 26-52, 22-28, 17-29	Parametric/non-parametric, GE(0)
Checchi and Peragine (2010	Italy	Earning	"parental education"	19.5	direct/indirect, non-parametric, GE(0)
Checchi et al. (2010)	25 European countries	Earnings	"parental education and occupation, gender, nationality and geographical location"	4-30; 16-45	direct/indirect, parametric/non-parametric, GE(0)
Zhang and Eriksson (2010)	China	Income	"parental income, parental occupation, parental household size, parental education, birth region, gender, age"	46-65	direct, parametric, Gini
Ferreira and Gignoux (2011)	Brazil, Columbia, Ecuador, Guatemala, Panama and Peru	Income, Consumption	"education level of mother and father, father's occupation, place of birth and race"	25-36; 27-53	direct/indirect, parametric/non-parametric, GE(0)
Ferreira et al. (2011)	Türkiye	Wealth, consumption	"type of area of birth (rural/urban), region of birth, parental education, mother tongue and number of siblings"	31-36; 26-32	direct, parametric/non-parametric, variance/GE(0)
Björklund et al., (2012)	Sweden	market income before taxes	"parental income, parental education, family type, number of siblings, IQ quartile and body mass index"	13.1-41.1	direct, parametric, Gini/GE(0)/GE(1) /GE(2)
Singh (2012b)	India	Earning, consumption	"father's education, father's occupation, caste, religion, and geographical region of residence"	5-19	direct/indirect, parametric/non-parametric, GE(0)
Suárez Álvarez and López Menéndez (2018)	Spain	Disposable income	"gender, immigration status, parental education, population density and region"	15-21	direct, parametric/non-parametric, GE(0)
Ferreira and Gignoux (2010)	Türkiye	Education (achievement)	"gender, parental education, father's occupation, region and area of residence, number of books at home, wealth (ownership of durable goods) and cultural possessions"	26-32	parametric, variance
Asadullah and Yalonetzky, (2012)	India	Education (school completion)	"gender and religion"		Pearson-Cramer Index, the Overlap Index and two versions of the Reardon Indices

Study	Country	Outcome	Circumstances	IoP (%)	Methodology
Salehi-Isfahani et al. (2014)	16 MENA Countries (inc. Türkiye)	Education (achievement)	"gender, family background variables (parental education, number of books at home, access to computer), ethnicity and community characteristics (size of the settlement, average class size, characteristics of the teacher, share of economically disadvantaged students)"	4.6-34; 4.4-38.7	direct/indirect, parametric, GE(2)
Tansel (2015)	Türkiye	Education (achievement)	"gender, parental education, father's occupation, region, migration status, possession of books and house amenities"	21-32	direct, parametric, variance
Golley and Kong,(2018)	China	Education (years of schooling)	"father's education, hukou status at age 12, parents' Communist Party membership, number of siblings, ethnicity, gender, region"	39.4	direct/indirect, parametric, GE(2)
Rosa Dias (2009)	UK	Health (SAH)	"parental socioeconomic background, congenital and childhood health conditions"	21.5-26.4	stochastic dominance, Health Pseudo-Gini
Trannoy et al., (2009)	France	Health (SAH)	"parental education, parental occupation and relative longevity of parents"	43*	stochastic dominance, Gini
Assaad et al. (2012)	Egypt, Jordon, Morocco, Türkiye	Health (Height, weight for health)	"parental education, region, urban/rural residence, wealth, mother's age at birth, multiple births or not, birth order and sex of the child"	4-15;1-8	direct/indirect, parametric, GE(1)
Jusot et al. (2013)	France	Health (SAH)	"parents' socioeconomic status, parents' health status, parents' lifestyles, family financial status"	44.5-46.4	Variance decomposition

3.1.3.2.2 Studies Employing the Human Opportunity Index Methodology

This section reviews the studies that define IOP as the inequality in access to opportunities due to differences in circumstances. Although there are very few exceptions, this branch of literature focuses on the IOP among children since children cannot be expected to make an effort to access opportunities and consequently all the inequality in access can be interpreted due to IOP. In the case of adults, it may be very complex to define opportunities and to distinguish the contribution of effort from the effect of circumstances. All the studies analyzed in this section use the Human Opportunity Index (HOI) methodology developed by Barros et al. (2009). As discussed in Chapter 4.2.1, HOI has some important decomposition properties. It can be decomposed over circumstances to identify the contribution of each circumstance

to inequality in access. This feature enables the policymakers to determine advantageous and disadvantageous subpopulations and design or modify the policies accordingly. Another feature of HOI is that the change in HOI over time can be decomposed into (i) composition effect that reflects the changes in circumstances over time and (ii) coverage effect which is the result of change in coverage over time. The coverage effect can be further decomposed into two sub-effects: (i) scale effect which reflects the proportional change in coverage rate of all circumstance groups and (ii) equalization effect which reflects the changes in HOI due to the change in marginal distribution of opportunities among circumstances groups when the overall coverage rate remains constant. In other words, the equalization effect captures the changes in HOI due to changes in IOP. Hence, the overtime changes in HOI are due to a combination of (i) population movements from one circumstance group to another such as migration from rural areas to urban, (ii) changes in-group specific coverage rates (hence in overall coverage rate) that does not alter the distribution of opportunities across circumstance groups and (iii) changes in group-specific coverage rates (IOP) that does not change the overall coverage rate. [53]

In their remarkable study, Barros et al. (2009) attempt to measure IOP[54] in 19 Latin America and Caribbean (LAC) Countries. In their analysis, they introduce the Human Opportunity Index (HOI) methodology and measure IOP in access to 5 opportunities regarding education and housing. The education dimension includes 2 opportunities, namely completing 6th grade on time and school attendance at ages 10-14. The housing dimension includes access to water, sanitation, and electricity. They use the following six circumstances in their analysis: gender of the child, area of residence, years of schooling of the household head, per capita family income, presence of both parents at home and number of siblings ages 0-16. Their analysis is based on data from 200 million students that came from separate surveys conducted in each of 19 LAC countries. They employed 2 waves of the survey that are closest to 1995 and 2005 in each country to measure the progress in a decade. For completing

[53] All concepts introduced in this paragraf are discussed more in detail in Section 4.
[54] The study utilizes two types of analysis. Only the first one is explained here since the second analysis was already covered in section 3.1.3.2.1.

6th grade on time, they found the average HOI was 62 percent and there is a large variance among countries ranging from 24 percent in Guatemala to 86 percent in Jamaica. Their results also showed that five countries (Bolivia, El Salvador, Guatemala, Honduras, and Nicaragua) have HOI values below 50%. For school attendance with an average HOI of 90 percent, the HOI values are higher and less diverse compared to previous opportunities ranging from 77 percent in Guatemala to almost universal access (98 percent) in Chile. For access to water, the overall HOI is 67 percent with the lowest value of 41 percent in Nicaragua and the highest value of 97 percent in Costa Rica. Furthermore, seven out of 19 countries have HOI over 85 percent. Access to sanitation has the lowest average HOI (43 percent) of all 5 opportunities. It is also the most dispersed among countries fluctuating between 11 percent (in Nicaragua) and 88 percent (in Costa Rica). In 5 countries (Bolivia, El Salvador, Guatemala, Honduras, and Nicaragua) the HOI is less than 22 percent. For access to electricity, the overall HOI is 78 percent ranging from 45 percent in Honduras to 99 percent in Chile. 10 countries have HOI values greater or equal to 90 percent. Barros et al. (2009) have also generated a summary HOI. To do that, they first generate education and housing indexes by averaging the overall HOI values of opportunities in each dimension. The simple average of these two indexes gives the summary index. The overall value of the summary index is 70 percent ranging from 46 percent in Nicaragua to 91 percent in Chile.

Regarding the change in HOI over time, Barros et al. (2009) found that there was an improvement for each opportunity but at different rates. The annual average change in HOI is calculated to be 1.5 for completing 6th grade on time, 0.5 for school attendance, 0.9 for access to water and electricity, and 1.0 for access to sanitation. Furthermore, they contend that two-thirds of the improvement in HOI roots from an increase in the coverage rate whereas one-third comes from the decrease in IOP (i.e. improvements in the distribution of available opportunities). As for contributors to inequality, parental education steps forward as the most important circumstance contributing to inequality in education. Location (urban/rural), on the other hand, is found to be the most important driver of inequality in housing.

World Bank (2010) provides an outlook on the IOP in Uruguay. The study computes the HOI scores at the national and subnational levels and identifies the main circumstances. The data comes from the 2008 wave of the Continuous Household Survey (Encuesta Continua de Hogares). The 21 opportunities investigated in the study are grouped under four categories, namely education, health, housing, and communication technologies (see Table 3-2 for the list of opportunities). The circumstances are selected as gender, type of area of residence, ethnicity, availability of both parents in the HH, per capita income, number of children younger than 16 in the HH, and years of schooling of the HH head. The education dimension includes opportunities that focus on attendance, completion, and learning a second language. Regarding the attendance subcategory, the analysis shows that attendance to primary and attendance to secondary (for children aged 10-14) is almost universal. Regarding the attendance of children aged 12-17, the HOI is lower and D-index is higher indicating that the secondary school attendance of older children is lower and distributed more unevenly. The HOI scores for completion on time are significantly lower than those of attendance. Furthermore, the HOI decreases rapidly from 78.3 (for 6^{th} grade) to 34.0 (or 9^{th} grade) as the grade gets higher. D-index also displays a similar trend and increases with grade. The on-time completion of 9^{th} grade is especially problematic in terms of both coverage (46 percent) and D-index (26.3) because the coverage rate itself is quite low and the access differs substantially for different circumstances. This implies that government intervention needs to focus both on increasing the coverage and improving the distribution. The last component of the education dimension is learning a second language, i.e. English which is an important transferable skill in the globalized world. Since the HOI scores are low for both speaking and writing English, the report suggests that the primary focus should be increasing the coverage for these opportunities. For the education dimension, the major contributors to inequality are the parent's education and income.

Table 3-2 The List, Opportunities in World Bank (2010) with HOI and D-Index Scores

Basic Opportunity	HOI	D-Index
Education		
Attendance primary (6-12)	99.0	0.2
Attendance secondary (10-14)	94.8	1.2
Attendance secondary(12-17)	80.7	4.8
On time completion of 6th grade	78.3	5.9
On time completion of 7th grade	61.2	13.6
On time completion of 8th grade	54.7	16.2
On time completion of 9th grade	34.0	26.3
Children speaking English	28.0	15.0
Children writing English	37.3	13.0
Health		
Preventive dental care	65.2	3.4
Have access to health services	72.8	4.0
Housing and infrastructure		
Access to sanitation: Connection to sewage or septic tank	73.0	10.0
Access to sanitation 2: connection to sewage only	37.3	18.7
Access to electricity	98.2	0.7
Water in the dwelling	95.1	1.8
Dwelling constructed in a non-flood-risk area	67.5	3.6
Dwelling constructed in a regularized lot	85.9	4.2
Communication technologies		
Access to computer	39.4	20.2
Access to internet	11.6	46.5
Cell phone in the HH	91.5	2.3
Telephone in the HH	38.1	24.2

World Bank (2010) investigates two health variables, namely access to preventive dental care and health services. For both opportunities, the HOI scores and D-index are low, therefore the primary focus of public policy should be increasing available opportunities. For dental care, the most important circumstances are the parent's education and income. For health care, on the other hand, income and availability of both parents are more important circumstances. The housing dimension is analyzed under two subcategories, access to infrastructure and well-constructed housing. The infrastructure sub-category includes access to electricity, water, and sanitation (2 definitions for sanitation, see Table 3-2). The access to electricity and water is nearly universal, hence the HOI is high and the D-index is low for these opportunities. However, access to sanitation is more problematic in Uruguay especially if sanitation is more strictly defined (connection to sewage only). The HOI decreases almost by half (from 73 to 37) between the two definitions. The D-index is

also quite high for only sewage connections. For the well-constructed housing category, The HOI of the non-flood risk area is low (67.5)[55] but the HOI for construction on a regularized lot is relatively higher (85.9). Since the D-indexes are low for both opportunities, increasing the overall coverage is the top priority. The analysis also revealed that the type of area of residence and income are the top two important circumstances for most of the housing opportunities. As for the information and communication technology dimension, the HOI for computer and internet is 39.4 and 11.6 respectively both of which are low. However, the D-indexes, especially for internet, are very high. These two facts together imply that access to these opportunities needs to improve both in terms of general access and equality. The last opportunities covered by the study are access to cell phones and landline phones. The HOI score for having a cell phone in the household is 91.5 and the D-index is low (2.3). Unlike cell phones, the landline telephone in households has much lower HOI (38.1) and significantly higher D-Index (24.2). The authors of the study suggest that the general trend of replacing home telephones with cellular phones may be behind such a big difference. Income and parent's education are the most important circumstances for all four opportunities under this dimension. World Bank (2010) provides regional analysis[56] for a selected subset of opportunities. The study reveals small regional variations in electricity and school attendance. However, the regional variation of HOI is much larger for completion of 6th grade, water, sanitation, and health services.

Vega et al. (2012) replicated the study of Barros et al. (2009) for the same 19 LAC countries by using newly available data and adding a new series of analyses such as comparison with developed countries and interregional analysis. They also use the same set of opportunities and the following seven circumstances: gender of the child, number of siblings, family per capita income, parents' education, presence of both parents at home, gender of household head, and location (urban/rural) for the duration of 1995 to 2010. Their analysis shows that human opportunities are expanding in the LAC region but at a slow and varying rate. The average growth rate in HOI was one

[55] The analysis on non-flood risk areas is based on rural dwellings due to unavailability of data.
[56] The regions are 19 departments of Uruguay.

percent between 1995 and 2010. Their analysis reveals that given the current growth rate, it would take another 36 years for LAC countries to achieve universal access to education and housing. They also contend that achieving universality may take even longer in reality since the growth rate falls as HOI increases. Their decomposition of HOI leads to findings that are very similar to Barros et al. (2009). They highlight that parental education and birth place (location) have a great impact on access to education and housing respectively. Most of the improvement in HOI over time comes from expanded coverage rates (54 percent). The remaining increase is attributable to improvement in group-specific coverage rates (27 percent) and changes in circumstances (20 percent). Their HOI analysis of the PISA results[57] of selected developed and LAC countries shows that even the best-performing country in the LAC region lags behind the worst-performing developed country. They further suggest that developed countries have not only higher access but also a more fair distribution of opportunities. The comparison of the housing opportunities[58] using census data gives slightly better results for LAC countries. They find that only a few LAC countries (Venezuela, Chile, and Mexico in sanitation and Brazil, Chile, and Costa Rica in overcrowding) perform better than the average of the selected European countries. Vega et al. (2012) subnational HOI analysis of 165 LAC states and cities gave rise to five main findings. First, the range and variety of HOI is substantial with Tierra del Fuego on top (HOI of 96 percent) and the Atlantic region of Nicaragua at the bottom (HOI of 29 percent). In all LAC countries, the capital cities perform better than the rest of the country and this gap increases as the national HOI decreases. Third, there is some evidence of convergence but at a very slow rate. Fourth, less decentralized and bigger countries have a higher variance of regional HOIs. Last, decentralization is associated with lower regional inequality in HOI.

Im et al. (2012) investigate the human opportunities in South Africa which is an upper-middle-income country with very high and persistent income inequality. The study utilized three kinds of analysis: i) computing HOI and comparing it

[57] The opportunities were defined as acquiring level two proficiency in reading, mathematics and science in PISA.
[58] Access to sanitation and freedom from severe overcrowding was the opportunities used in the analysis.

internationally ii) decomposing the change in HOI overtime and iii) identifying the major circumstances. The data source of the study is the 2002, 2005, and 2010 waves of General Household Surveys in South Africa. The basis opportunities, the HOI, and D-index scores of these opportunities are presented in Table 3-3. The study employs a rich set of circumstances: gender, ethnicity, household composition, orphan status, education, age and gender of HH head, and location. The analysis reveals that South Africa provides almost universal access to school for children aged 6-15; however, it does not perform as well in primary school completion for which the HOI score is only 50.7 and the inequality is high (D-index: 10 percent). With these HOI scores, South Africa leads the LAC and African countries in school attendance but lags behind the LAC countries in timely completion of primary education. As for access to safe water and sanitation, South Africa performs better than African countries but falls behind the LAC countries. The D-index of safe water and sanitation indicates that these opportunities are distributed unevenly among circumstance groups. Regarding access to electricity, South Africa does way better than African countries but does not do as well as most of the LAC countries. As for another indicator for which international comparison is not possible, South Africa provides adequate school infrastructure, adequate teachers, and telecommunication services to more than 90 percent of its citizens in an equal manner. Nevertheless, exposure to Early Childhood Development Programs, access to no overcrowding, and safe locations are low with HOI scores of 59.9, 48.9, and 61.3 respectively. The D-index for overcrowding is high indicting that 16.5 percent of the available opportunities should be redistributed to vulnerable groups to comply with the EOP principle. The coverage of health insurance which shows the ability to access health services is extremely low with 13.8 percent of the population having health insurance. Furthermore, the inequality is very high for this opportunity. The second type of analysis looks at the dynamics behind the change in HOI scores over time. HOI scores improved for all the opportunities from 2002 to 2010. For most of the opportunities, the improvement comes from the scale effect. The equalization effect also plays a significant role in telecommunication, sanitation, and electricity. The composition effect is important for no overcrowding, safe water, and electricity. The annual change in HOI for the majority of opportunities is lower in South Africa compared to most of the LAC countries. However, the annual change for access to

electricity is highest in South Africa among all the LAC and African countries included in the study. As for the third type of analysis, they demonstrated that gender and education of household head play a significant role in inequality in finishing primary education on time. These two circumstances account for more than 50 percent of the total inequality. Location is the main source of inequality for most of the opportunities but its contribution is more pronounced for infrastructure indicators (water, sanitation, electricity) and for ECD exposure. The circumstances related to HH composition (parents and siblings at home) are the main drivers of inequality for no overcrowding. Regarding this decomposition, the authors note that *"these decompositions should not be taken to imply that race and gender based disparities are not important. Rather, race and gender are less important by themselves when other circumstances (which may be shaped by race and gender in the first place) are taken into account. This also implies that many of the apparent racial and gender gaps in opportunities for children in South Africa today could be narrowed if opportunities could be equalized across groups differentiated by socioeconomic status and, above all, location."*

Table 3-3 HOI, D-Index and Coverage of opportunities analyzed in Im et al. (2012)

	2002			2005			2010		
	HOI	D	C	HOI	D	C	HOI	D	C
School attendance (ages 6-11)	89.8	2.1	91.7	94.9	1.2	96.0	98.2	0.4	98.5
School attendance (ages 12-15)	95.4	1.2	96.6	96.9	0.8	97.7	97.6	0.5	98.1
Finish primary school on time (ages 13-15)	42.5	14.8	49.9	49.4	12.5	56.5	50.7	10.0	56.3
Adequate infrastructure in school	70.4	5.4	74.4	76.4	5.4	80.7	90.6	0.9	91.4
Adequate teachers in school	87.1	1.1	88.1	86.8	1.9	88.5	92.6	0.7	93.2
ECD exposure (ages 0-4)	-	-	-	-	-	-	59.9	5.7	63.5
Have health insurance	5.4	56.8	12.4	5.0	55.7	11.3	7.3	47.4	13.8
No overcrowding	42.2	19.6	52.5	41.8	19.6	52.0	48.9	16.5	58.5
Access to safe water on-site	40.3	28.2	56.1	44.7	23.2	58.3	48.3	23.3	63.0
Access to improved sanitation	27.8	38.1	44.9	41.3	23.0	53.6	54.6	18.4	66.9
Access to electricity	60.7	12.9	69.7	68.3	10.0	75.9	77.0	6.1	82.0
Access to telecommunications	30.7	23.7	40.2	60.8	9.4	67.1	91.5	1.9	93.3
Safe location	-	-	-	-	-	-	61.3	4.0	63.8

Singh (2012a) analyzed inequality in access to educational opportunities in India. The author measured inequality in access to only one opportunity, namely completion of the fifth standard[59] on time for children of age between 10 and 12. The circumstances are caste of the household head, religion, gender of the child, place of residence, wealth, parental education and number of siblings. The data source for the study is the 1992/93 and 2005/06 waves of the National Family Health Survey (NFHS). The coverage rate, D-index, and HOI scores for India and 6 regions in India are presented in Table 3-4. Accordingly, both the coverage rate and HOI increased for completion of the fifth standard on time in India and six regions from 1992/93 to 2005/2006. However, the level is still very low. In 2005, only one-third of children aged 10-12 completed the lower primary school on time. Furthermore, the inequality (D-index) is high (19 percent) implying that almost one-fifth of the available opportunities should be redistributed from better-off groups to disadvantaged groups. The South region has the highest HOI value and lowest inequality. On the other hand,

[59] This level in Indian education system corresponds to lower primary education.

the east region has the lowest HOI and highest D-index. The improvement in HOI is highest in the South (24 percentage points) and lowest in the East (one percentage point). This is somewhat surprising since regions with higher (lower) initial access generally exhibit slower (faster) improvement. In his study, Singh compares the performance of India with LAC Countries presented in Barros et al. (2009) and highlights that has HOI score of India for completing primary on time is lower than 18 LAC Countries. Lastly, Sindh looks at the source of change in HOI to show if it is due to scale effect or distribution effect and finds that scale effect accounts for more than two-thirds of the improvement in HOI at the national level. At the regional level, the contribution of distribution effect is higher in only two regions, namely the East and Central regions that have the lowest HOI.

Table 3-4. Coverage, D-Index, and HOI Scores for India and Indian Regions (Singh, 2012a)

Region	1992/93			2005/06		
	C	D	HOI	C	D	HOI
North	25.8	26.7	18.9	33.5	18.8	27.2
Central	22.2	30.5	15.4	25.2	20	20.1
East	19.5	38	12.1	18.5	29.2	13.1
North East	23.3	27.6	16.9	30.9	21.8	24.2
West	36.2	20.9	28.6	39.0	16.6	32.5
South	40.6	18.8	28.6	61.9	7.9	57.0
India	28.2	26.2	20.8	33.4	19.3	26.9

Son (2012) looks at IOP in education and housing infrastructure using HOI methodology in seven Asian countries. The study investigates access to five opportunities: primary and secondary school attendance (for children aged between 6 and 11 and between 12 and 17 respectively), access to safe water, electricity, and sanitation. The seven circumstances employed in the study are gender, type of place of residence, education level of HH head, gender and age of HH head, (per capita) household expenditure and household size. Using household surveys conducted between the years 2007 and 2010[60] to compute D-Index and HOI, Son (2012) finds that for primary school attendance, the inequality is lowest in Sri Lanka (D-Index = 0.1) and highest in Pakistan (D=8.7) and conversely, HOI is lowest in Pakistan (68.1)

[60] Philippines is an exception where the survey was conducted in 2002.

and highest in Sri Lanka (99.27). The analysis also reveals that access to secondary education is comparatively lower and distributed more unequally. For secondary school attendance, the D-Index ranges between 2.19 (in Sri Lanka) and 15.12 (in Pakistan) and the HOI ranges from 47.64 in Pakistan to 84.49 in Sri Lanka. As for access to safe water and sanitation, the countries generally exhibit lower and more uneven performance compared to the education dimension. Regarding access to safe water, five out of seven countries have HOI scores lower than 35 percent with the exceptions of the Philippines (54.12) and Bhutan (86.91). The HOI scores for access to sanitation range from 13.38 (in Bangladesh) to 92.10 (in Sri Lanka). Access to electricity is less problematic compared to other dimensions of basic infrastructure. The HOI scores for electricity ranges between 20.08 (in Bangladesh) and 95.78 in Vietnam. Moreover, six countries have HOI scores higher than 60 percent. The author has also analyzed the contribution of individual circumstances to inequality and revealed that for all of the five opportunities, urban-rural divide and household expenditure are the main contributors to IOP.

Newman (2012a) and (2012b) look at the IOP at the national and regional levels in Pakistan. The list of opportunities analyzed in the study is given in Table 3-5. The circumstances are gender, urban/rural, region[61], household size, real per capita consumption, education level of HH head and gender of HH head. The data source is the 1998-99 and 2007-08 waves of Pakistan Social and Living Standards Measurement (PSLM) Surveys. The national HOI scores and D-index values are summarized in Table 3-5. The analysis shows that the HOI index improves for all of the four education indicators. The inequality (d-index) decreases for primary and secondary enrollment and primary completion but increases for secondary completion. For health indicators, the HOI increases slightly for not having diarrhea in the last 30 days and the D-index remains the same. Furthermore, there are large improvements in HOI and equality (1-D-index) for all three immunization indicators. Similarly, the HOI increases for all health care indicators although the level is remarkably low except for births attended by traditional or formal attendants. Unfortunately, this increase in healthcare indicators

[61] Region is excluded in the regional level analysis.

is accompanied by increased inequality. The D-index has risen for four of the five healthcare indicators. This implies low levels of access with high inequality for prenatal and postnatal care, births attended by formal birth attendants and institutional births. Regarding the infrastructure indicators, there have been significant improvements in access to sanitation, water, and electricity both in terms of access and equality although there is some room for further improvement especially in access to sanitation. The HOI scores for access to gas and telephone are very low despite the improvement over time. Inequality is also high and rising for these two indicators.

Table 3-5. List of opportunities, HOI and D-Index scores in Newman (2012a) and (2012b)

Basic Opportunity	HOI (98/99)	HOI (07/08)	D-Index (98/99)	D-Index (07/08)
Education				
Primary enrolment	48.3	67.2	9.1	7.0
Secondary enrollment	42.3	55.5	9.6	8.6
Primary completion	46.4	55.7	10.0	9.3
Secondary completion	19.3	25.6	8.9	9.5
Health				
No diarrhea	86.9	88.7	0.9	0.9
Received any immunization	76.7	94.1	4.1	1.2
Full immunization (self-report or record)	43.5	69.1	6.4	5.1
Full immunization (only record)	25.7	45.8	6.5	5.8
Prenatal care	5.9	20.2	2.6	4.1
Postnatal care	6.1	16.4	2.6	4.4
Birth by any attendant	71.2	80.2	7.3	5.5
Birth by formal attendant	13.0	31.0	6.5	7.5
Institutional birth	11.0	28.0	5.7	7.7
Infrastructure				
Improved sanitation	27.3	46.4	11.2	8.5
Improved water	71.4	84.6	9.1	4.6
Electricity connection	61.9	84.8	8.2	4.5
Gas connection	7.0	14.2	10.9	13.4
Telephone	10.2	13.1	6.1	6.2

The regional-level analysis of Newman (2012b) investigates the access to the same opportunities for Punjab, Sindh[62], Balochistan and Khyber Pakhtunkhwa (KP).

[62] The study also includes a further division of Sindh province into two sub regions (Karachi and other parts of Sindh) but the results for these sub-provinces are not reported here.

As for primary school enrollment, the HOI scores have risen in all four provinces over the period ranging between 46.8 (in Balochistan) and 75.0 (in Punjab) in 2007/08 and the inequality has decreased in all four provinces. There is also an improvement in secondary education but the improvement is limited compared to primary education. For Secondary education, the most recent HOI scores lie between 40.8 (in Balochistan) and 60.5 (in Punjab). The regional D-indexes are also large ranging between 7.7 (Punjab) and 10.1 (Sindh). Regarding completion of primary education, the HOI for Balochistan (36.0) lags far behind the other three provinces (59.6, 52.4 and 50.8 in Punjab, Sindh and KP respectively). The same pattern also holds for completion of secondary school (15.7 in Balochistan, 22.1 in KP, 25.3 in Punjab and 30.0 in Sindh). Alarmingly, the inequality (D-index) in secondary completion has risen in three provinces except for KP. The education level of the HH head is found to be the most important circumstance for all education indicators and all provinces with few exceptions. For KP, gender is responsible for most of the inequality in enrollment to primary and secondary and primary completion. Again, gender is the most important circumstance for secondary enrollment in Balochistan. Regarding health indicators, the HOI scores and D-index for no diarrhea are similar for all provinces (around 90 and 1 respectively). For immunization, all three indicators experience large improvements in HOI scores. The HOI scores range between 86.7 (Balochistan) and 97.8 (Sindh) for any immunization, between 53.7 (Balochistan) and 72.4 (Punjab) for full immunization (self-reported or record) and 30.7 (Sindh) and 52.7 (Punjab) for full immunization with record. As for access to health care services, the HOI score for access to prenatal care lies between 17.1 (Balochistan) and 21.1 (KP), hence there is little regional difference. Access to postnatal care also does not exhibit much variation for Punjab, Sindh and KP with HOI scores lying between 15.9 and 18.5. However, Balochistan lags behind the other three provinces with an HOI score of 8.3. There is a more pronounced regional variation for births attended by any attendee where the HOI score for Punjab and Sindh is around 90 and the HOI score for Balochistan and KP is around 55. The HOI scores drop remarkably when the definition of the indicators is restricted to only formal birth attendees. For this indicator, the HOI changes between 18.8 (Balochistan) and 33.2 (Punjab). The regional variation is also significant for institutional births ranging between 12.7 (Balochistan) and 31.0 (Sindh). As for the

most important circumstances, the education of the household head and type of place of residence stands out as the main sources of inequality for most of the health indicators and provinces. Per capita consumption and HH size were also important for some indicators and provinces. Regarding infrastructure indicators, the regional HOI scores exhibit a dual structure for access to sanitation where the HOI scores for Punjab and KP is approximately 50 and the HOI for Balochistan and Sindh is around 35. For access to water, Punjab has the highest HOI (96.1) followed by Sind (86.0), KP (67.8) and Balochistan (54.6). The ranking for access to electricity is KP (92.0), Punjab (88.7), Sindh (78.2) and Balochistan (56.6). As for access to gas, the highest HOI belongs to Sindh (19.4) followed by Punjab, Balochistan and KP (6.4). For access to telephone, Sindh and Balochistan experienced a decrease in HOI score from 1997/98 to 2007/08 while the other two provinces enjoyed a twofold increase. As of 2007/08, the HOI scores range between 4.3 (Balochistan) and 17 (Punjab).

Velez et al. (2012) analyze the state of inequality in terms of access to opportunities including its contributors and overtime dynamics in Egypt. The study investigates 16 opportunities and 3 composite opportunities presented in Table 3-6. The opportunities are grouped into four categories, namely education, basic housing services, early childhood development and nutrition and hunger. The first composite indicator (named IOH (0-4-Nutrition & ECD)) reflects the nutrition and early childhood development needs of children aged between 0 and 4. The other two composite indicators are constructed by using housing indicators for children aged 0-4 and 9-15 respectively[63]. The circumstances are gender, number of children in the household, number of people elderly or disabled in the household, presence of parents, parental education, income per capita, location (urban/rural), and region (4 regions). The data come from two sources: the 2000 and 2009 waves of the Household Income, Expenditure and Consumption Surveys (HIECSs) for education and housing indicators and the 2000 and 2008 waves of the Egypt Demographic and Health Survey. The results in Table 3-6 reflect that the HOI of 13 of the 15[64] opportunities and 2 composite

[63] The study assumes that the child has access to the composite indicator if s/he has access to at least 4 of the individual indicators included in the composite indicator. The aggregate indicators compose of 7, 6 and 5 indicators respectively.
[64] Not 16 due to lack of data for school attendance in 2000.

opportunities has improved from 2000 to 2009[65]. The HOI deteriorated for immunization and non-wasting and it remained the same for non-stunting and composite indicator of nutrition and ECD. The improvement in the HOI score is uneven. The HOI for access to a telephone, cooking energy source, assisted delivery and prenatal care has risen at least 20 percentage points. The improvement in composite housing indicators is also remarkable (37 and 34 pp). Furthermore, the authors decomposed the overtime change in HOI and found that the scale effect (increase in coverage rate of all groups) accounts for at least 60 percent of the improvement in 11 opportunities. The contribution of the scale effect is most dominant for access to post-natal care, telephone, prenatal care and assisted delivery (91, 78, 76 and 74 percent respectively). The deterioration in access to immunization is mainly due to the increase in IOP, whereas the decrease in non-wasting is the result of the scale effect. The study also looks at the rural-urban and regional differences. Their main finding is that children in urban areas and metropolitan regions face better opportunities compared to their peers. However, there is evidence of convergence between regions.

Table 3-6 List of opportunities, HOI and D-Index scores in Velez et al. (2012)

	2000			2009		
Opportunity	**C**	**(1-D)**	**HOI**	**C**	**(1-D)**	**HOI**
Complete primary educ. on time	84	93	78	86	95	82
Complete secondary educ. on time	62	87	54	63	11	57
School attendance, 9-15	-	-	-	92	97	89
Water	83	92	77	91	97	88
Sanitation	40	65	26	44	68	30
Lighting energy source	99	99	98	99	100	99
Cooking energy source	82	89	73	99	99	97
Non-overcrowding, 0-5	61	78	48	69	85	59
Telephone	24	56	14	78	91	71
Assisted birth delivery	73	88	64	89	95	84
Post-natal care, 0-5	22	85	19	32	88	28
Prenatal care, 0-4	66	87	58	83	94	78
Immunization vaccines, 0-4	89	98	87	89	96	85
Non-wasting, 0-4	89	99	88	79	95	75
Non-stunting, 2-17	74	93	69	72	96	69
Non-underweight, 0-17	85	95	80	87	97	85

[65] 2008 for indicators coming from EDHS.

	2000			2009		
Opportunity	**C**	**(1-D)**	**HOI**	**C**	**(1-D)**	**HOI**
Aggregate 0-4 (Housing)	35	71	35	72	90	72
Aggregate 9-15 (Housing)	49	77	49	83	94	83
Aggregate 0-4 (Nutrition & ECD)	14	66	14	14	56	14

Aran and Ersado (2013) provide another study that looks into children's access to opportunities in Egypt. There are 18 opportunities investigated in the study grouped under four main categories: (i) health care utilization (antenatal and postnatal care, assisted delivery, birth facility and immunization), (ii) nutrition (stunting, wasting, underweight, access to iodized salt, use of iron tablets during pregnancy), (iii) housing and basic services (safe water, sanitation, electricity, possession of identity card) and (iv) education (primary and secondary school attendance, completion of 6^{th} and 9^{th} grade on time). The circumstances are location (urban/rural x region), parental education, gender, number of children at home, wealth and consumption. All these variables come from the 2000 and 2008 waves of the DHS. Only the per capita consumption variable is imputed from the Household Income, Expenditure and Consumption Survey (HIECS). Based on the HOI methodology, the results reveal that the access rate, equality (1- D-index) and HOI score of four health outcomes (antenatal and postnatal care, assisted delivery and birthplace) have improved from 2000 to 2008. Only immunization displays a deterioration. The HOI of immunization decreases from 91.9 to 90.3. Still, immunization is the most widely accessed (coverage: 91.6 in 2008) and most equally distributed (D-index: 1.4) of all five health outcomes. The lowest HOI score belongs to postnatal check (27.3 in 2008), followed by birth facility (63.4), antenatal check (67.7), and assisted birth (71.5). The authors have also constructed a composite outcome variable of health by combining assisted delivery, health facility, and postnatal check-ups. This variable is defined in a way that it is equal to one if access to all three opportunities is granted and it is equal to zero otherwise. The HOI for this composite health indicator increased from 10.8 in 2000 to 19.9 in 2008. The decomposition of the HOI between periods suggests that most of the improvements in HOI come from the scale effect, although the redistribution of opportunities also has a significant contribution. Shapley's decomposition of the D-index reveals that wealth followed by the mother's education and region are the most important circumstances

for all opportunities except immunization. In the case of immunization, region is the most important circumstance (42 percent of the D-Index), followed by wealth. Regarding nutrition, the HOI scores for stunting, wasting, and underweight decreased by an average of four points from 2000 to 2008. However, the HOI for access to iodized salt and iron tablets has significantly improved from 19.6 to 71.9 and from 18.8 to 37.3 respectively. Similarly, the composite nutrition index (not stunted, not underweight, and has access to iodized salt) increased more than threefold increase from 14.2 to 46.1 in terms of HOI scores. The decrease in HOI scores of stunting, wasting, and underweight over time is due to the negative scale effect implying that the coverage (i.e., the probability of not being stunted, wasted, or underweight) has decreased for everyone. The increase in HOI of access to iodized salt, access to iron tablets, and composite index from 2000 to 2008 is largely due to the scale effect, but the improvement in inequality also makes an important contribution. Further analysis indicates that gender is the most important circumstance accounting for 59, 38, and 24 percent of inequality for stunting, wasting, and underweight. For iodized salt and iron tablets, the most important circumstance is household wealth (responsible for 45 and 33 percent of the D-index respectively), followed by the mother's education. As for the housing and basic services dimension, the HOI and equality (1- D-index) have improved for all four opportunities. In 2008, access to safe water, electricity, and identity card was almost universal with HOI scores of 96.5, 96.5, and 98.3 respectively. The HOI score for sanitation is 90.9. The HOI of the composite index of accessing all four opportunities at the same time has risen significantly from 73.8 in 2000 to 86.0 in 2008. Location is the most important circumstance for safe water and birth registration contributing 51 and 32 percent of inequality respectively. On the other hand, wealth is the main source of the variation in sanitation and electricity. Regarding education indicators, all four opportunities display an increase in terms of HOI scores. The highest HOI score (92.2 in 2008) belongs to primary school attendance. Completing 6^{th} grade on time has the highest (both absolute and relative) increase in HOI from 60.3 in 2000 to 78.8 in 2008. Secondary enrollment and completing 9^{th} grade on time have HOI scores 65.9 and 53 in 2008 respectively. The overtime improvement in education variables mainly comes from the increase in general coverage (scale effect), the contribution of redistribution of opportunities is

comparatively limited. Mother's education, father's education, and wealth together are responsible for approximately three-fourths of the D-index.

In their cross-country study, Dabalen et al. (2015) investigated the state of EOP in 20 Sub-Saharan African (SSA) countries using HOI. These 20 countries represent around 70 percent of the population and a large share of the geographic area of the region. The data source is DHSs conducted in the late 1990s and late 2000s. The analysis focuses on nine opportunities grouped under education, infrastructure, and health categories. The list of the opportunities is given in Table 3-7. The availability of data and the perspective given in Millennium Development Goals has guided the choice of opportunities. Their analysis includes circumstances that were categorized under 5 groups, namely child characteristics, household composition, location, household head characteristics, and socioeconomic status. The individual circumstances under each group are given in Table 3-8. The circumstances utilized in the education and infrastructure dimension are the same. However, they need to slightly change the circumstances for health opportunities due to the unavailability of data and the nature of the basic service[66]. For the list of circumstances, Dabalen et al. (2015) acknowledge that the absence of ethnicity (or tribal affiliation) as a circumstance due to the unavailability of data was a notable omission.

[66] The health indicators were collected using a module that is different from the modules of education and infrastructure. Therefore, the authors needed to slightly different circumstances for the health dimension. Moreover, Dabalen et al. (2015) asserted that the birth order was only relevant to health and therefore it was not included in the analysis for other dimensions.

Table 3-7. List of Opportunities analyzed in Dabalen et al. (2015)

Category	Opportunity	Age Group
Education	Primary school attendance	6-11
	Secondary school attendance	12-15
	Started primary on time (1)	6-7
	Finished primary school (2)	12-15
Infrastructure	Access to safe water	<16
	Access to sanitation	<16
	Access to electricity	<16
Health	Full immunization	1
	No stunting	0-2

(1) Defined as attending primary for 6 years old and having at least one year of education for 7 years old.
(2) Defined as attending 6th grade for 12 years old and completing at least 6 years of education for 13-15 years old.

Table 3-8. List of Circumstances analyzed in Dabalen et al. (2015)

Category	Education opportunities	Infrastructure opportunities	Health opportunities
Child Characteristics	Child's gender	Child's gender	Child's gender
	-	-	Birth order
Household Composition	Number of children (0-15) in the HH	Number of children (0-15) in the HH	Siblings living in the HH
	Presence of elderly	Presence of elderly	Presence of elderly
	Presence of both parents in the HH	Presence of both parents in the HH	Mother living with a husband or not
	Both parents alive	Both parents alive	-
Location	Urban/rural	Urban/rural	Urban/rural
Household head/mother characteristics	Level of education of the HH Head	Level of education of the HH Head	Education level of mother
	Age of HH head	Age of HH head	Age of mother
	Gender of HH head	Gender of HH head	-
Socioeconomic status	Wealth quintile	Wealth quintile	Wealth quintile

The types of analysis Dabalen et al. (2015) utilized are computing the HOI, decomposing the changes in HOI over time, identifying the circumstances that contributed to total inequality the most, and comparison of countries within SSA and SSA with other regions. Regarding education opportunities, they find that the SSA countries are significantly far from providing universal access to all four education opportunities and the IOP was high. SSA countries are performing better in school attendance compared to starting or finishing primary school on time. The average

HOI[67] is 63 and 72 for school attendance at ages 6-7 and 12-15 respectively whereas it is 27 for both starting and completing primary on time. Moreover, the relative ranking of countries differed remarkably from one opportunity to another. For example, Nigeria ranks 4th in both starting and completing primary school on time but ranks 12th and 14th in school attendance at ages 6-7 and 12-15 respectively. They also highlight that the gap between coverage rate and HOI decreases with age for school attendance implying that the circumstances have a higher effect on attendance for younger children. Regarding basic infrastructure services, Dabalen et al. (2015) contend that the average HOI for access to safe water and sanitation is 68 and 62 respectively. The penalty (the gap between coverage rate and HOI) is 4.8 for access to safe water and 7.4 for access to sanitation implying that the circumstances mattered more for sanitation. The HOI for electricity is very low. Only two countries have HOI scores above 30 (Ghana 37 and Senegal 32.3) and seven countries have HOIs below 10. As for health opportunities, the average HOI is 53 percent and 59 percent for full immunization and not being stunted respectively. Furthermore, there exists higher variation among countries for full immunization than for not being stunted. The HOI for immunization ranges from 16 (in Nigeria) to 88 (in Rwanda), whereas it ranges from 46 (in Niger) to 73 (in Ghana) for stunting. The unweighted standard deviations are 20 and 7 for immunization and stunting respectively.

Dabalen et al. (2015) also define two bundles of opportunities which minimum constitute the set of opportunities that are necessary for a child to have a productive life in the future and investigated the HOI regarding the bundles. The first bundle consists of access to safe water, sanitation, full immunization and not being stunted which represents the minimum set of opportunities for infants. The second bundle includes access to water, sanitation, and school attendance representing the minimal set of opportunities for children between 6 and 11 ages. In the construction of HOI, the child is accepted to have access to the composite opportunity if s/he has access to all the opportunities in the bundle. Similarly, the children with a lack of access to at least one opportunity in the bundle are categorized as not accessing the composite

[67] All the averages in this study are simple, unweighted averages.

opportunity. The HOI ranged from 2 (in Niger) to 28 (in Senegal) for the first bundle and from 3 (in Niger) to 69 (in Malawi) for the second one. These figures show that there exist large variations between countries and the opportunities are more limited for younger children. This difference in HOI between the two bundles is largely attributable to high access to schooling (in the first bundle) and comparatively low access to health opportunities (in the second bundle). The correlation between the two HOIs is 0.78 indicating that countries doing comparatively better (worse) for one age group are also doing better (worse) for other age groups. In light of the findings, Dabalen et al. (2015) propose that to improve HOI for access to electricity, sanitation, and timely completion of primary school, the governments should focus on improving equity along with expansion of coverage. However, the countries should prioritize expanding coverage to improve HOI for opportunities with comparatively low levels of inequality i.e., stunting, immunization, and school attendance.

Dabalen et al. (2015) have also analyzed the change in HOI from the 1990s to the 2000s and the factors that contributed to the change for 16 countries. For educational opportunities, they find that 16 and 13 countries have statistically significant annual increases in access to school. For starting primary school on time, only 8 countries exhibited a significant annual increase in HOI and 3 countries experienced a significant decrease in HOI. For completing school on time, 13 countries experienced a significant annual increase in HOI. The improvements in HOI of all four educational opportunities are mainly attributable to the scale effect (increase in overall coverage rate without improvement of equality). The equalization effect (improvement in inequality without changing overall coverage) also contributed to the improvements but to a much lesser degree. Regarding the change in infrastructure opportunities, Dabalen et al. (2015) establish that 11 and 12 countries (out of 17) make significant improvements in access to water and sanitation respectively. Only six countries experience improvements in both basic services. For electricity, 15 countries experienced significant improvement in HOI but the increase was at a very low pace (0.05 percent). For access to safe water and sanitation, the improvement roots predominantly from the scale effect. On the contrary, equalization and composition effects are the main drivers of the improvement in electricity. Regarding health

opportunities, 12 and seven countries (out of 16) make significant improvements in HOI for full vaccination and nutrition. The change in HOI is largely due to the scale effect for all four opportunities while the equalization effect also has some contribution. For composite HOI, there are larger improvements in the bundle for older children in almost every country.

The third type of analysis employed by Dabalen et al. (2015) is identifying the contribution of circumstances to total inequality. For this analysis, the DHS conducted in the late 2000s is used. They find that the socioeconomic background variables largely determine a child's chance to access an opportunity. For all opportunities, wealth and education of household head (or mother in health) are the most prominent circumstances. Location is the third largest contributor to total inequality. The circumstances that are generally associated with discrimination (i.e. gender) are found to be less important contributors to inequality although there are some expectations. Similar to gender, household composition has a low contribution to total inequality on average.

Lastly, Dabalen et al. (2015) analyzed the association of access to opportunities with economic indicators of well-being and compared country groups within SSA and SSA with the LAC region. They find that HOI is positively correlated with GDP per capita but the IOP index (D-Index) is negatively correlated with GDP per capita. Their analysis also reveals that IOP is not correlated with income inequality (Gini coefficient). Furthermore, they show that consumption poverty and composite HOI are negatively correlated within SSA. Comparing the Anglophone and Francophone countries, they assert that Anglophone countries on average have higher HOI than Francophone countries while the gap between the two groups has narrowed over time. Finally, the comparison of SSA with LAC indicates that SSA countries were comparable to LAC countries in HOI for school attendance but lagged far behind in completing primary on time and access to basic infrastructure.

In another cross-country study, Hlasny and Intini (2015) investigated early childhood development opportunities in 14 Arab countries. The data of the study comes from Multiple Indicator Cluster Surveys (MICS), DHS, and the Pan-Arab

Project for Family Health (PAPFAM) Surveys. The opportunities of the study are the opportunities that contribute to early childhood development (ECD). These opportunities are categorized into three groups and presented in Table 3-9. The circumstances are wealth, education level of mother and father, urban/rural, regions, gender of the child and the HH head. The coverage rate of the opportunities shows that the access to ECD opportunities is low, especially to opportunities such as immunization, use of iodized salt, etc. The figures show that 90 percent of children experience some type of violence (verbal or physical) and 30 percent of all children have to do some kind of work outside of their home. Furthermore, the nutritional indicators especially stunting are not promising in the selected countries. Unsurprisingly, there is significant variation in access rates among countries. For example, the use of iodized salt ranges between 1.5 and 91 percent. Similarly, stunting is as high as 46 percent in Yemen compared to 7.4 percent in Palestine. Such vast deviations are apparent in all indicators. Only violent discipline shows comparatively less variation ranging between 70 and 99 percent implying violence is common in all countries. The country-specific figures imply that Comoros, Jordan, and Palestine are performing better in providing ECD opportunities. On the other hand, access to ECD is very problematic for Iraq, Mauritania, Morocco, Somalia, Sudan, and Yemen. The study also compares the access rate of the households in the top and bottom wealth quintiles. This comparison reveals remarkable differences between these two groups in terms of access rates. Violent discipline provides an exception to this since the incidence of violence differs little between the top and bottom wealth quintiles. At the country level, Palestine is another exception that provides a similar level of access to many opportunities for the wealthiest and poorest households. A similar comparison is also made for the most and least advantaged households[68]. The within-country differences in this comparison are even more pronounced. Regarding the D-index values, the authors conclude that the inequality is high in the Arab countries for which the average D-index ranges between 8.5 and 33.8 percent[69]. The D-index also varies between 0.2 (skilled delivery in Palestine) and 59.1 (early childhood education in

[68] The least advantaged households are those living in rural and less developed regions, with mother and father no formal education and in the bottom wealth quintile.
[69] The D-index of violent discipline (2.4 percent) is excluded.

Somalia) across all countries and opportunities. Since the coverage is poor and inequality is high for most of the opportunities and countries, the HOI scores are generally low. Lastly, the study looks at the circumstances that contribute to the inequality. On average across opportunities and countries, wealth accounts for around 24 percent of the total inequality. The same figure for mother's and father's education, urban/rural and region are 19, 15, 10 and 29 percent respectively. However, these shares change significantly across opportunities and countries.

Table 3-9. List of opportunities, Coverage, HOI and D-Index scores in Hlasny and Intini (2015)

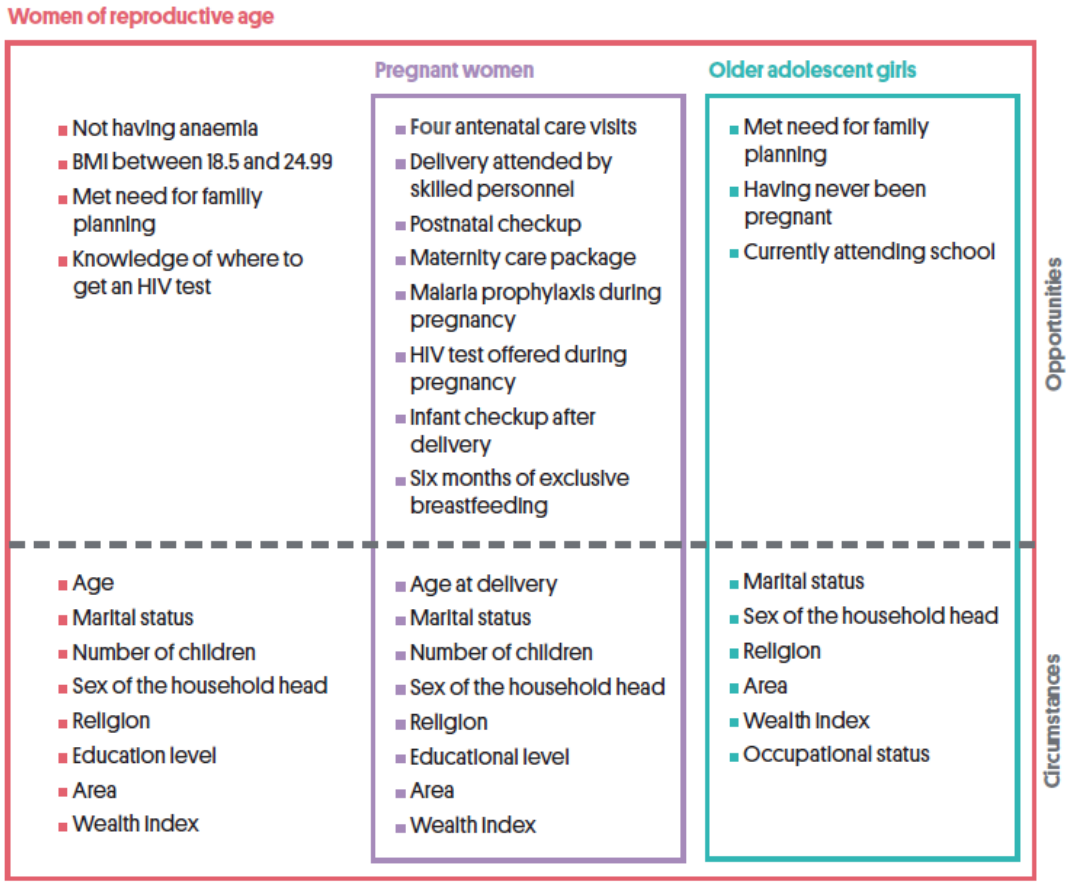
Basic Opportunities	C	D	HOI
Health			
Prenatal care	79.5	8.5	73.9
Prenatal care 4+ visits	60.9	14.8	53.0
Skilled delivery	79.3	9.6	70.3
Full Immunization	47.6	12.4	46.9
Neonatal Mortality	2.2	19.5	4.4
Infant Mortality	3.7	15.9	4.1
Nutrition			
Stunted	21.4	12.9	22.7
Underweight	11.6	16.0	10.9
Wasted	7.8	12.7	13.5
Use of iodized salt	54.1	21.0	41.4
Early Childhood Development			
Engagement in developmental activities	51.1	12.1	47.2
Preschool attendance	31.0	29.0	29.2
Early childhood education	20.8	33.8	12.8
Violent Discipline	90.4	2.4	91.1
Child labor	30.2	12.6	33.9

Note: The reported coverage (C), D-index (D) and HOI scores are weighted averages computed using the most recent value of the indicator for each country and the weights are the 2015 population size of the countries.

Jemmali and Amara (2015) analyze the regional component of the inequality in access to opportunities in Tunisia. Unlike any other study, they only look at the regional HOI and do not analyze IOP at the national level. The data source of the study is the 2005 National Survey on Households' Budget, Consumption and Standard Living. The authors examine only five opportunities which are access to primary and secondary school, access to water, sanitation and electricity. For access to primary education, the analysis shows that there is little variation in HOI among seven regions. The HOI score for access to primary varies from 76 to 85 percent. The authors claim

that the low variation among regions is due to increased investments in primary education and the available legislation that imposes sanctions on parents whose children do not attend school. For secondary education, the HOI scores are much lower and the variation is more pronounced. The HOI scores differ between 38 and 55 percent for this opportunity. The authors attribute this low access and high variation to early-age employment and insufficient infrastructure in rural parts of central regions of Tunisia. For primary education, the type of area of residence is found to be the most important circumstance in four of the seven regions contributing 40 to 90 percent to inequality. The education level of the HH head is the most important circumstance for access to secondary education in six regions. Its contribution ranges from 40 to 80 percent. Per capita expenditure also plays a significant role in access to secondary. Gender is important for southern regions. The HOI scores for access to safe water differ vastly. The HOI is around 50 percent in two regions, 75 percent in one region and the remaining four regions have HOI's over 85 percent. For access to sanitation, the HOI scores are much lower, less than 40 percent in six regions. On the other hand, access to electricity is almost universal in all seven regions ranging from 96 to nearly 100 percent. The authors claim that the differences especially in access to water and sanitation are due to economic and social disparities between inland and littoral parts of the country. The most important circumstance for both access to water and sanitation is inarguably the type of place of residence followed by expenditure. These two circumstances generate around 90 percent of inequality. As for access to electricity, per capita expenditure contributed between 53 and 89 percent to inequality in six regions. Only in the Middle East region, the household size explains 81 percent of the variation in access.

Figure 3-2. Summary of opportunities, circumstances and groups of women included in Pons Duran et al. (2016)



Similar to Dabalen et al. (2015), Pons Duran et al. (2016) also investigated the IOP in Sub-Saharan African countries (SSA). However, Pons Duran et al. (2016) study is unique in that it focuses on the access of women (not children) to basic (health) opportunities. As previously discussed and will further be discussed in Section 4, access to basic goods and services can be determined by circumstances and individual effort. Since it may not always be possible to distinguish the contribution of circumstances and effort from each other in the case of adults' access to opportunities, the opportunities fail to satisfy the exogeneity condition given in Section 4.1 and the HOI methodology may not work. Acknowledging this complication, Pons Duran et al. (2016) state that women in low-income countries constitute a vulnerable group and their choices (use of birth control, access to prenatal care) are mostly affected by external factors such as income, education level and region. They further argued that this view is especially pronounced in the case of health opportunities such as anemias

and malnutrition. The study focuses on three subpopulations: (i) adolescent girls between 15 and 19 years of age, (ii) women who had children in the last 2 or 5 years (6 months for breastfeeding) and (iii) women of reproductive age (includes both (i) and (ii)). The opportunities investigated differ for each group. For the first group, opportunities related to related to reproductive health and educational attainment are analyzed. For the second group, the indicators of interest are related to pregnancy, infants' health status and breastfeeding. Anemia, weight status, met need for family planning and knowledge of HIV tests are the opportunities for the last group. The list of opportunities and circumstances is given in Figure 3-2. The data source for the study is the DHSs conducted between 2010 and 2015 in 29 SSA countries. The study highlights that the pooled average HOI for met need for family planning is 46 and it ranges between 20 and 78. The HOI for knowledge of where to get an HIV test is highly correlated with the prevalence rate of AIDS and it ranges between 25 and 99. The pooled HOI for not having anemia and having the recommended BMI is around 60 and these opportunities exhibit relatively lower inequality. Regarding the pregnant women group, the maternity care indicators, have low coverage and high inequality where the pooled HOI is around 35 and 40 percent for all of the 3 opportunities. The maternity care package, which is a composite indicator of the other three care indicators, has a very low HOI score of 16 and the HOI ranges between zero (Ethiopia) and 60 (Namibia). A similar situation also holds for malaria prophylaxis for which the HOI score ranges between zero (Burundi) and 90 (Gambia). Not surprisingly, the HOI for offering HIV testing during antenatal care exhibits a similar pattern to that of knowledge of a place where to get an HIV test. HIV testing is more prevalent in countries with higher AIDS rates. Infant checkup is another indicator with low HOI score and high range (3 in Ethiopia and 81 in Burkina Faso). Exclusive breastfeeding is the indicator with the highest HOI score of 78 and the lowest D-index (1.1 percent). For older adolescent girls, the met need for family planning has lower HOI compared to that of women of reproductive age (40 and 46 respectively). It ranges between 12 (in Gambia) and 68 (in Namibia). The HOI score for never been pregnant among older adolescent girls is comparatively higher and the inequality is lower among SSA countries. For school attendance among adolescent girls, the HOI is low (40 percent) and the range between countries is pronounced. For pregnant women and women of

reproductive age in general, the most important circumstances are wealth, urban/rural and education level. These circumstances are the main sources of inequality. For adolescent girls, on the other hand, marital status is the most important circumstance.

Table 3-10 Simple Average and Pooled HOI scores for the opportunities in Pons Duran et al. (2016)

	Opportunities	Simple average	pooled average
Women of reproductive age (15-49 years old)	Not having anemia	45.47	62.55
	Having the recommended BMI	58.76	62.06
	Met need for family planning	46.26	46.14
	Knowledge of a place where to get an HIV test	66.48	60.90
Pregnant women	Four antenatal care visits	46.20	34.21
	Delivery attended by skilled personnel	53.10	36.96
	Postnatal checkup	52.77	40.90
	Maternity care package	26.08	15.87
	Malaria prophylaxis during pregnancy	47.45	42.52
	HIV test offered during pregnancy	61.26	57.51
	Infant checkup within two months after delivery	45.51	31.65
	Six months of exclusive breastfeeding	76.67	78.09
Older adolescent girls (15-19 years old)	Met need for family planning	37.80	40.01
	Having never been pregnant	63.72	66.24
	Currently attending school	39.45	40.17

Note: Simple average represents the non-weighted average of country level HOI's. The pooled average is obtained from the data set constructed by pooling all the all surveys.

Krishnan et al. (2016) look at the IOP in six MENA countries using the HOI methodology. The study employs the opportunities given in Table 3-11[70]. The circumstances are gender of the child, number of children in the household, single-parent household, educational attainment of household head, and type of residence

[70] Some other opportunities also analyzed in the study depending on the data availability. The additional group of opportunities are: (i) no wasting, no stunting, no underweight, reliable electricity, sufficient water supply, no frequent interruptions of water supply for Iraq, (ii) assisted birth, any prenatal care for Morocco and (iii) waste correctly disposed for Egypt and Morocco. The scores for these opportunities are not reported here because we could not find the exact scores in the study.

(urban/rural)[71]. The data come from the DHS conducted in each country between 2007 and 2012. According to Table 3-11, school attendance is high and it ranges from 80 percent to 98 percent. For this indicator, the inequality is relatively high in Morocco and Iraq and it is less than 2 percent in Jordan, Tunisia and the West Bank and Gaza. The HOI ranges between 76 percent and 98 percent. The West Bank and Gaza exhibit the highest coverage, lowest d-index and hence the highest HOI score of all six countries. For completing at least six years of basic education among children ages 12-16, the coverage is lower than that of school attendance. It differs between 50 percent in Morocco and 99 percent in Jordan. Interestingly, Jordan's coverage for school completion is higher than attendance. The dissimilarity index is as low as 0.2 percent in Jordan and as high as 18 percent in Morocco. It changes around 4-6 percent for the other four countries. The HOI score also lies between 41 and 99 percent. Access to tap water in the dwelling is low in Morocco and Jordan (50 and 67 percent), whereas it is almost universal in Egypt and the West Bank and Gaza. In Morocco, not only access is low but also the available opportunities are distributed very unevenly (D-index is 36 percent). On the other hand, although the access is low in Jordan, the D-index is also low implying a fair distribution. The inequality is also low (around 2-3 percent) in Iraq and West Bank and Gaza. The HOI score exhibits even a larger gap between countries changing between 32 percent and 92 percent. In access to sanitation (connection to public sewerage network), all of the six countries perform poorly and the coverage rate, equality and HOI are lowest for this indicator compared to the other three opportunities. The coverage rates range between 23 and 59 percent. The D-index is no less than 13 percent in any country and no country has a HOI score above 49 percent. This indicates that all the countries have a long way to go for the universal provision of public sewerage. The authors also analyzed the contribution of each circumstance to inequality. For all four opportunities, the education of the household head and the type of place of residence together account for a significant portion of inequality.

[71] Some additional circumstances are also used at country level analysis for opportunities given in the previous footnote. These circumstances are presence of elderly at the household, age of household head, occupation of household head (public worker or not), region and wealth.

Gender is also an important factor in education opportunities in Iraq and West Bank and Gaza.

Table 3-11. Coverage, D-Index, and HOI scores for the opportunities in Krishnan et al. (2016)

	School attendance			Finishing basic education			Access to water			Access to sanitation		
	C	D	HOI	C	D	HOI	C	D	HOI	C	D	HOI
Egypt	95.2	2.2	93.2	83.4	3.8	80.2	94.2	2.0	92.3	59.3	18.1	48.5
Jordan	87.5	1.8	85.9	99.3	0.2	99.1	66.6	5.2	63.2	53.4	18.3	43.6
Morocco	82.8	7.6	76.5	49.8	17.7	41.0	50.2	36.2	32.1	46.5	42.3	26.9
Iraq	80.1	4.8	76.3	80.6	5.5	76.2	84.4	9.5	76.4	23.4	36.9	14.7
Tunisia	94.7	1.8	93.0	73.7	6.5	68.9	82.1	12.7	71.6	53.6	31.5	36.7
WB and Gaza	98.3	0.4	97.9	90.0	1.9	88.3	93.3	2.7	90.7	56.3	13.5	48.7

Sanoussi (2017) analyzes the IOP in children's health by evaluating access to prenatal and postnatal care in Togo. The study uses the 1998 and 2013 waves of Togo DHS and investigates the access to health opportunities given in Table 3-12. The circumstances employed in the study are parental education, parental occupation, wealth, gender of the household head, gender of the child, number of children in the household, region, and residence (urban/rural). The analysis reveals that there is improvement in four of the circumstances in terms of both coverage and HOI. Access to immunization and prenatal care by qualified staff are the two opportunities for which the access deteriorates. Institutional birth exhibits the largest improvement in HOI (27 percentage points) followed by access to any prenatal care (13 percentage points). Despite the improvement, the level of HOI is low except for access to prenatal care. The inequality (D-index) also decreases for four opportunities. The two opportunities for which the inequality increased are access to prenatal care by qualified staff and access to adequate care. Sanoussi (2017) also looks at the contribution of each circumstance to inequality and suggests that parental education, region and residence are the most important circumstances. Analyzing the overtime change in HOI, the author finds that the scale effect is mainly responsible for the variations in HOI.

Table 3-12. Coverage, D-Index and HOI scores for the opportunities in Sanoussi (2017)

Opportunities	C		D-Index		HOI	
	1998	2013	1998	2013	1998	2013
Birth in a public or private health center	46.08	71.37	24.81	14.31	34.65	61.16
Access to immunization	55.01	25.70	12.23	8.48	48.29	23.52
Access to prenatal care	82.31	92.77	5.97	3.03	77.39	89.96
Access to prenatal care by qualified staff	84.87	68.88	5.86	12.49	79.90	60.27
Having at least four antenatal visits	46.06	54.25	13.12	11.65	40.02	47.92
Adequate care[72]	6.53	9.30	27.74	28.64	4.72	6.62

The study of Prieto et al. (2018) is unique in that it is the only study that we can find that applies the HOI methodology in a developed country context. The study examines the inequality in access to quality basic education in the USA. The data comes from a case study in the School District of Hillsborough County (SDHC) and therefore it is not representative at the national level. Using school enrollment data, school accountability data and student applications data for the SDHC 2015/16, the authors investigate whether admission to high-quality schools (magnet schools) is associated with the circumstances of the children or not. The circumstances are categorized into four groups: child characteristics (race, gender, disability), household characteristics (mother language, sibling at school, parental occupation, qualification for free meal[73]), location (distance from selected school, urban/rural) and assigned school characteristics (ESEA compliant accountability factor[74]). Their analysis reveals that the HOI and D-index for access to magnet schools is 70 and 6 respectively. If the opportunity is defined as access to high-quality magnet schools, then the HOI decreases to 59 and the D-index rises to 9. The decomposition of the D-index indicates that the assigned school characteristic is the most important circumstance. The parental occupation, race, and whether the child qualifies for free meals are other circumstances that significantly contribute to inequality. The authors also discuss the advantages that HOI has over Parity Indices (PI) in measuring inequality of equality. They conclude

[72] It is a composite indicator of all other opportunities and takes the value of one if access is granted to all five opportunities.
[73] This indicator is used to proxy the socioeconomic status of the student since children from low income households qualifies for free or reduced price meal at magnet schools.
[74] It shows whether the school to which the child is assigned has high number of disadvantaged students or not.

that HOI provides better insights for policymakers because i) HOI measures inequality due to multiple circumstances simultaneously, ii) HOI utilizes both coverage and inequality at the same time and iii) HOI is decomposable over circumstances.

4. METHODOLOGY: MEASURING INEQUALITY OF OPPORTUNITY

As shown in the previous chapter, there are different approaches to measuring the level of IOP. Some studies focused on measuring the contribution or effect of inequality of equality to total outcome inequality such as income or student performance. This study uses a different methodology for measuring IOP. This methodology is called Human Opportunity Index (HOI) which was developed by Ricardo Peas De Barros et al. (2009). This index measures inequality in discrete variables which are defined as children's access to opportunities. HOI tracks two dimensions of access to opportunities and combines them into a single measure. The first dimension is the coverage rate which shows how many opportunities, which are crucial for children to have a productive life, are available. The second dimension reflects the degree to which the available opportunities are distributed in line with the equal opportunity principle. In line with this definition, Vega et al. (2012) define HOI as a *"synthetic measure of how far a society is from universal access to a good or service, and how equitably access is distributed across circumstances."* Similarly, the HOI can also be interpreted as "a *social welfare function that reacts to both changes in overall access to basic opportunities for children, as well as to their equitable distribution* (World Bank, 2010)."

If universal access to opportunities is the ultimate goal, then it may seem that the coverage rate by itself is enough to measure progress. The coverage rate shows the proportion of the population who has access to a specific opportunity. Therefore, it also contains the information of how far a society is from providing full access. However, the coverage rate is not sensitive to allocation. If countries do not have enough resources for the universal provision of services, then some population groups will have access and other groups will not. If this is the case, only the coverage rate will not be enough to indicate whether this allocation decision is made in line with the EOP principle. Because different allocation decisions will have the same coverage rates but will have varying levels of EOP. Hence, the coverage rate is not enough to measure progress towards EOP.

4.1 Basic Concepts

Before going into the computation, it is necessary to elaborate on some basic concepts such as opportunities and circumstances from the HOI perspective. Basic opportunities are human capital investments that enrich individuals' abilities and options for future advancement in life. Examples of opportunities are education, health services, immunization, nutrition, safe water, electricity, birth certificates, etc. Barros et al. (2009) identified four characteristics of opportunities. In order to be defined as an opportunity, a good or service should:

i. affect the outcome of interest such as income, health, or student performance,
ii. be critical from the human development point of view,
iii. be exogenous to the individual but access to it should be controllable by society,
iv. be unfairly affected by the circumstances.

The third characteristic, i.e. exogeneity to the individual, makes it complex to define opportunities for adults because some seeming opportunities may partially or completely be a result of effort. That is because adults are expected to exert some level of effort to access certain opportunities such as housing conditions and nutrition. However, in the case of children, any good or service that is critical for human development can be identified as an opportunity. This is because access is beyond the control of the children; they cannot be expected to make an effort to access opportunities such as electricity, sanitation, immunization, nutrition, etc. Hence, IOP can safely be held responsible for all the inequality rooting from circumstances in the case of children. Vega et al. (2012) highlight other characteristics of opportunities. According to Vega et al. (2012), for a service to be an opportunity, there should be a national consensus regarding the universal provision of that service. The opportunities are generally identified in national documents such as national development plans or in international documents such as the Sustainable Development Goals.

Circumstances are socially determined personal, family, or community characteristics over which children do not have control. They are exogenous to the child and the whole society agrees for ethical reasons that they should not alter outcomes. Gender, income, ethnicity, race, religion, and location are some examples of circumstances. However, there is no universal list of circumstances because they are specific to society. Therefore, each society may have its own list of circumstances. EOP demands that the limited opportunities are distributed non-systematically among circumstances groups so that each individual has the same chance of access regardless of his or her circumstances.

EOP requires equalization of opportunities at all stages of an individual's life. However, this is not always possible due to the complexity of the problem. As previously discussed, in the case of adults, It is not an easy task, if not impossible, to distinguish IOP from effort. Even, if it would be possible, Barros et al. (2009) stated that attempts to equalize opportunities for adults are not cost-effective and generally not successful. In the case of children, on the other hand, lack of endogeneity makes it straightforward to identify opportunities. Moreover, EOP in early life provides a fair start and enhances EOP throughout the whole life. Early interventions in the life cycle also provide transgenerational improvements in EOP. This approach also has an ethical standpoint, because children cannot be held responsible for the circumstances they were born to. Advocating these ideas, the World Bank (2014) contended that increasing equity in children's access to quality opportunities will establish a virtuous circle between growth and poverty reduction by lowering inequality of outcomes in adulthood and enhancing economic efficiency.

Therefore, social policy should focus on providing equal opportunities for children to enable them a fair start in life. Supporting the idea of focusing on children, Barros et al. (2009) state that a country departs from EOP if children's access to opportunities is correlated with the circumstances over which children have no control and that "a *goal of social and economic policy should be to reduce that correlation as much as possible and provide a level playing field to all children."*

4.2 The Human Opportunity Index

The Human Opportunity Index utilizes the coverage and distribution of opportunities to trace a country's progress in achieving universal provision of opportunities. It is an EOP-sensitive coverage rate, and its construction requires discounting a penalty (P) for the prevailing inequality from the overall coverage rate (C).

$$HOI = C - P \qquad (1)$$

The level of penalty depends on the differential access among circumstance groups to the opportunity. It is equal to zero if all the circumstance groups have the same coverage rate. It increases if the difference between group-specific coverage rates rises. To compute the penalty, the opportunity-vulnerable groups (OVG) need to be identified first. The OVG are the circumstance groups that have a coverage rate that is lower than the overall coverage rate. Then for each OVG k, the opportunity gaps should be computed. The opportunity gap is the difference between M_k and $\bar{M}_k$. Here, M_k is the number of people that should have had access if the group-specific coverage (C_k) rate had been equal to the overall coverage rate (C) and $\bar{M}_k$ is the actual number of people that have access to OVG k. The opportunity gap reflects the additional number of opportunities needed to be allocated to an OVG to eliminate IOP. The sum of the opportunity gaps divided by the total population (N) gives the penalty (equation 2).

$$P = \frac{1}{N}\sum_{k=1}^{v}(M_k - \bar{M}_k) \qquad (2)$$

The computation of the coverage rate is straightforward. It is the number of available opportunities (O) divided by the total population (N). Alternatively, it can be computed as a weighted average of the circumstance-group specific coverage rates (C_i) where weights (w_i) are the population share of each circumstance group i.[75]

[75] Note that the computation includes all the circumstance groups, OVG and non-OVG.

$$C = \frac{O}{N} \qquad (3)$$

$$C = \sum_{i=1}^{v} w_i C_i \qquad (4)$$

Vega et al. (2012) identify three important properties of HOI. First, it is *equality sensitive*. For a given coverage rate, it increases as inequality among circumstance groups increases and it decreases if the reverse happens.

Secondly, the index is *Pareto consistent*. That is, if any circumstance group is provided with additional opportunities without decreasing the opportunities the other groups have, the index will increase. Two different cases need to be evaluated for a better understanding of this property. Suppose one of the non-OVG is provided with additional opportunities. Then, since the increase in coverage rate will be higher than the increase in penalty, the index improves. If one of OVG is provided with additional opportunities, then the coverage rate increases but the penalty decreases leading to higher improvement in the index compared to the first case. In fact, Vega et al. (2012) showed that the increase in the index will be by $100\frac{1-\lambda}{N}$ percentage points in the first case and $100\frac{2-\lambda}{N}$ percentage points in the second case where λ is the total population share of OVG.

Third, if the group-specific coverage rates increase proportionally, then the HOI will increase by the same proportion. This can easily be seen from equations (1) (2) and (4). If group specific coverage rate increases by $\bar{\alpha}$ percent, then the overall coverage rate would also increase at the same rate since the weights remain the same in Equation 4. Moreover, since both M_k and $\bar{M}_k$ will also increase by $\bar{\alpha}$ percent, the penalty will do the same (equation 2). Placing the new coverage rate and penalty in equation 1 will lead to an increase in HOI by $\bar{\alpha}$ percent.

Given the form of equation (2), P is the share of opportunities (share within the population) that need to be reallocated from non-OVG to OVG to comply with the EOP principle. Therefore, P can be constructed as a Dissimilarity Index (D) by dividing P by the overall coverage rate (C). This way D would indicate the number of

opportunities that need to be reallocated as a percentage of the total number of available opportunities. In other words, the D index can be interpreted as the share of opportunities that are not allocated in line with the EOP principle. Similarly, (1-D) would mean the share of properly assigned opportunities.

Given this transformation, HOI can be written as follows:

$$HOI = C - P = C * (1 - D) \quad (5)$$

In the form given in equation (5), HOI is the average coverage rate discounted by the level of IOP (D). The D-index takes values between 0 and 1. It will be zero in case of perfect equality. However, D can only asymptotically approach to 1. The explanation for this case is simple. There will be at least one properly allocated opportunity in any allocation; therefore, D can never be equal to 1[76].

The computation of HOI from a random sample microdata is slightly different (See Box 2). In the case of a random sample, the access probabilities rather than actual access rates of children are utilized. In the first step, a logistic regression is run to estimate the empirical relationship between each circumstance and access to an opportunity. Then, the coefficients of the model are used to estimate the access probability of each child with given circumstances (Step 2). The weighted average of individual access probabilities is computed to find the overall coverage rate (step 3). In step 4, the dissimilarity index (D) is computed using the access probability gaps for each child[77]. Once (C) and (D) are calculated, computing the penalty (step 5) and the HOI is straightforward (step 6).

[76] See Barros et al (2008) for a formal proof.
[77] At Step 4 at Box 2, the weighted average of access probability gaps is divided by 2 because the formula includes all the children and not only opportunity vulnerable children.

Box 2. Computation of HOI using Microdata (Vega et al., 2012)

Step 1: Estimate a separable logistic model on whether child i had access to a given basic good or service as a function of his or her circumstances. From the estimation of this logistic regression, obtain coefficient estimates.

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

$$\hat{p}_i = \frac{\text{Exp}(\hat{\beta}_0 + \sum_{k=1}^{m} \hat{\beta}_k)}{1 + \text{Exp}(\hat{\beta}_0 + \sum_{k=1}^{m} \hat{\beta}_k)} \qquad (6)$$

Step 3: Compute the overall coverage rate C,

$$C = \sum_{1}^{n} w_i p_i \qquad (7)$$

where $w_i = 1/n$ or sampling weights.

Step 4: Compute the Dissimilarity Index D

$$\widehat{D} = \frac{1}{2C} \sum_{i=1}^{n} w_i |p_i - C| \qquad (8)$$

Step 5. Compute the penalty,

$$\text{P} = \text{C} * \widehat{D} \qquad (9)$$

Step 6. Compute the HOI = C – P

$$\text{HOI} = \text{C} - \text{P} \qquad (10)$$

4.2.1 Decomposition of the Human Opportunity Index

HOI enables two different decompositions: decomposition over the inequality contributors and decomposition over time. The first type of composition reveals how much each circumstance contributes to overall inequality at a given time. The second one, on the other hand, elaborates on what factors (and how much each factor) contributed to the change in HOI between two different points in time.

4.2.1.1 Decomposition of HOI over Inequality Contributors

D index is sensitive to changes in inequality between circumstance groups and it is possible to capture how much each circumstance contributes to overall IOP by applying the Shapley decomposition methods developed by Shorrocks (1999, 2013). This method captures the change in inequality when a new circumstance is added to the different combinations of preexisting set of circumstances. However, since the circumstances are correlated with each other, the order of addition of new circumstances changes the marginal effect. To overcome this problem, the marginal effects of adding a new circumstance to all of the possible subsets of preexisting circumstances are calculated. The weighted average of these marginal effects would give the impact of adding the new circumstance (Hoyos and Narayan, 2011).

The impact of adding circumstance A to total inequality is given in equation 11:

$$D_A = \sum_{S \subseteq N \setminus \{A\}} \frac{|s|!\,(n - |s| - 1)!}{n!} [D(S \cup \{A\}) - D(S)] \qquad (11)$$

where N is a set of all circumstances from 1 to n, S is a subset of N that does not contain the circumstance of interest A, D(S) is the dissimilarity index when the circumstances of the subset S are included, $D(S \cup \{A\})$ is the dissimilarity index when the set of circumstances S and circumstance A included.

To illustrate equation 6, the formula led to the following for three circumstances A, B, and C:

$$D_A = \frac{2}{6}[D(A,B,C) - D(B,C)] + \frac{1}{6}[D(A,B) - D(B)] + \frac{1}{6}[D(A,C) - D(C)] + \frac{2}{6}[D(A) - 0]$$

The contribution of circumstance A to the dissimilarity index M_A is calculated as follows:

$$M_A = \frac{D_a}{D(N)} \qquad (12)$$

where

$$\sum_{i \in N} M_i = 1 \qquad (13)$$

Since the sum of the total contribution of circumstances is one (equation 13), M_A can be interpreted as the percentage contribution of circumstance A to total inequality. The "Hoishapley" module in Stata is used in this study to compute the decomposition of HOI.

This property of HOI is useful to identify the more disadvantaged groups of the population in terms of access to opportunities. Once the most important circumstances are identified for predefined opportunities, governments can develop special policies for the different segments and enhance the effectiveness of the policies.

4.2.1.2 Decomposition of Changes in HOI over time

HOI is a function of group-specific coverage rates and the distribution of population over circumstances. Therefore, changes in group-specific coverage rates and the population share of circumstance groups change the HOI. Since HOI is additively decomposable, the contribution of each factor to the total change over two points of time can be computed. Vega et al. (2012) named the contribution of change in the distribution of circumstances to total change in the index as the composition effect. The contribution of the change in at least one group-specific coverage rate to the overall change in HOI is called as coverage effect. The coverage effect can also be decomposed into two effects. The first is the equalization effect which refers to the changes in IOP and the second is the scale effect which refers to the changes in group-specific coverage rates.

Box 3. Decomposition of Changes in HOI

Let 1 and 2 be two points in time (2 being later than 1) for which the HOI is calculated. Then, the change in HOI between the periods is:

$$\Delta = HOI_2 - HOI_1 = C_2(1 - D_2) - C_1(1 - D_1) \quad (9)$$

Adding and subtracting $C_2(1 - D_{mix}) - C_{mix}(1 - D_{mix})$ to equation (9), we get

$$\begin{aligned}\Delta = {} & C_2(1 - D_2) - C_1(1 - D_1) + C_2(1 - D_{mix}) - C_2(1 - D_{mix}) \\ & + C_{mix}(1 - D_{mix}) \\ & - C_{mix}(1 - D_{mix}) \end{aligned} \quad (10)$$

Where

- C_{mix} is the coverage rate in the mix HOI (HOI computed for population distribution in period 2 with the group-specific coverage rates from period 1) and,
- D_{mix} is the dissimilarity index in the mix HOI (HOI computed for population 2 with the structure of group-specific coverage rates from population 1 and overall coverage level in 2)

Restructuring equation (10) will give:

$$\Delta = [C_{mix}(1 - D_{mix}) - C_1(1 - D_1)] \rightarrow \text{Composition Effect} \quad (11.1)$$

$$+[(C_2(1 - D_2) - C_2(1 - D_{mix})] \rightarrow \text{Equalization Effect} \quad (11.2)$$

$$+ [C_2(1 - D_{mix}) - C_{mix}(1 - D_{mix})] \rightarrow \text{Scale Effect} \quad (11.3)$$

Source: World Bank (2019a, 2019b)

The mathematical expression of this decomposition is given in Box 3. Equation 11.1 shows the computation of the composition effect that is the result of the change in the composition of the population between two periods. In (11.1), the two HOI share the same group-specific coverage rates, but they differ in the distribution of population. Therefore, the difference in equation 11.1 reflects the change in HOI due to the change

in the distribution of population among circumstances between periods 1 and 2. The composition effect roots mainly from demographic changes such as urbanization and migration and economic and social development such as a fall in poverty rates or an increase in educational enrollment.

Another source of change in HOI comes from the change in-group specific coverage rates which is called as coverage effect. The sum of (11.1) and (11.2) reflects this effect. In expression of $C_2(1-D_2)-C_{mix}(1-D_{mix})$, the two populations share the same distribution, but the first HOI is computed from the group-specific coverage rates in period 2, but the second one is computed from that of period 1. Therefore, the difference merely reflects the changes in-group group-specific coverage.

The coverage effect can root from two different types of changes in coverage rates. The first one is the case in which all the group-specific coverage rates change proportionally without changing the inequality. This component of the coverage effect is called the scale effect. Equation (11.3) demonstrates the computation of the scale effect. In (11.3), the two HOI share exactly the same dissimilarity index but they differ in the group-specific coverage rates. (C_2 utilizes the coverage rates in period 2, whereas C_{mix} is based on coverage rates in period 1).

The second type is the case in which the group-specific coverage rates of OVG change but the overall coverage rate remains constant. This requires any improvement (or degradation) in coverage rates of OVG to be compensated by a fall (rise) in coverage rates of non-OVG. This type of change in the equalization effect implies an improvement in equality. Equation (11.2) computes the equalization effect because the two HOIs in (11.2) share the same overall coverage rate and population distribution but differ in terms of group-specific coverage rates.

4.2.2 Limitations of HOI

HOI measures how a child's access to opportunities is affected by his or her circumstances. This approach requires a concrete definition of access because having an opportunity is defined with access in HOI perspective. Vega et al., (2012) highlight two conditions that should accompany access. The first one is utilization. Utilization

requires actually using the opportunity in addition to accessing it. For example, a child enrolled in school is not utilizing the opportunity if she cannot regularly attend the classes. Similarly, having an electricity connection at home is not enough as there are frequent and long-lasting blackouts. The second condition that needs to be satisfied is the quality. The quality of the opportunities is rarely uniform, in fact, there is major inequality in the quality of the services that different groups enjoy. The varying quality of education or health services is an example of this case. To actually take advantage of the opportunity, the children should be accessing and utilizing quality opportunities. If this is not the case, children born into disadvantaged groups may not be able to develop the skills to realize their potential. (World Bank, 2014).

However, HOI cannot capture the utilization and quality features of access if the surveys are not designed accordingly which is the case most of the time. To include these aspects in consideration, additional questions that assess the utilization and quality of the service need to be added to surveys. However, this might not always be possible for some opportunities such as education or health services because it is possible to measure the quality of a school or a health facility in a household survey. Alternatively, Vega et al. (2012) defined access as a "*means to reach minimum levels of certain outcomes that ought to be compulsory"* and proposed to measure if acquiring the predefined level of outcome correlates with circumstances. Nevertheless, Vega et al. (2012) highlighted that "*in principle, EOP should not necessarily lead to equality of outcomes or even to a minimum basic outcome for all.*"

HOI is a function of the set of circumstances. It changes with the change in the circumstances included in the analysis. In fact, HOI decreases or remains the same (because (D) increases or remains the same) if a new circumstance is added. Therefore, the dissimilarity index (D) should be interpreted as a lower bound of inequality if all the circumstances are not included in the analysis. Moreover, HOI is not sensitive to the redistribution of opportunities within OVG or non-OVG. That is, a reallocation of opportunities from an OVG to another OVG (or from a non-OVG to another non-OVG) does not alter HOI.

Using the HOI method, this study will not only measure the IOP in Türkiye over time but also decompose the inequality into its contributors and elaborate the sources of change between 1993 and 2013.

5. DATA

The data source of this study is the Türkiye Demographic and Health Surveys (TDHS) that are conducted every 5 years from 1993 to 2018. The study uses all of six TDHS conducted in 1993, 1998, 2003, 2008, 2013 and 2018. TDHS are part of the DHS program. DHS are nationally representative household surveys that provide data for numerous indicators. DHS was conducted more than 400 times in over 90 countries (DHS Program, 2019a).

TDHS are part of national demographic surveys that have been systematically conducted every five years since 1968. From 1993 onward, it has been conducted as a part of the DHS Program. The last TDHS which was conducted in 2018 is the 11th of the demographic survey series and the 6th of TDHS.

TDHS provide information on the socioeconomic characteristics of households and women, family planning trends and levels in fertility, infant and child mortality, marriage patterns, maternal and child health, nutritional status of women and children, and reproductive health. It also provides data on many opportunities such as housing, access to education and health services and includes a rich set of circumstances.

Six TDHS conducted from 1993 to 2018 are investigated below to determine their comparability and possible analysis domains. A summary of the surveys is provided in the Annex.

5.1 Sampling Design

The six TDHS have the same sampling design. The sample in each study is selected by using a weighted, multistage, stratified, cluster sampling approach. This approach allows for producing estimates of a wide range of indicators for numerous domains. These domains are provided in Table 5-1.

Table 5-1. Representative domains of TDHS

1993	1998	2003	2008	2013	2018
Türkiye	Türkiye	Türkiye	Türkiye	Türkiye	Türkiye
Urban/Rural	Urban/Rural	Urban/Rural	Urban/Rural	Urban/Rural	Urban/Rural
5 Main Regions[78]	5 Main Regions[91]	5 Main Regions[91]	5 Main Regions[91]	5 Main Regions[91]	5 Main Regions[91]
-	-	12 NUTS 1 Regions[79]	12 NUTS 1 Regions[92]	12 NUTS 1 Regions[92]	12 NUTS 1 Regions[92]
-	-	-	7 metropolitan cities (1million+)[80]	7 metropolitan cities (1million+)	-

All six TDHSs are representative at the country level (Türkiye as a whole), urban and rural levels, and at five main regions that constitute Türkiye. With the introduction of a new regional breakdown, i.e. "The Nomenclature of Territorial Units for Statistics (NUTS)" in 2002, TDHS from 2003 onwards were conducted accordingly and this enabled producing estimates of selected indicators for 12 NUTS 1 regions (HUIPS, 2004). Similar to the five main regions, the 12 NUTS together compose the entire Türkiye. In 2008 and 2013, the sampling design was modified so that the estimates for some indicators could be produced for the seven largest metropolitan cites that have populations over 1 million. This approach in THDS 2008 and 2013 was terminated in 2018 due to the decrease in the number of stratus and the change in the rural and urban definition and indicators for metropolitan areas cannot be produced in TDHS 2018.

[78] Five main regions are: *"West; South, Central, North, and East"*
[79] 12 NUTS1 regions are: *"Istanbul, West Marmara, Aegean, East Marmara, West Anatolia, Mediterranean, Central Anatolia, West Black Sea, East Black Sea, Northeast Anatolia, Central East Anatolia and Southeast Anatolia"*
[80] The seven metropolitan cities with population one million and higher are: *"İstanbul, Ankara, İzmir, Bursa, Adana, Konya, Gaziantep"*

Since access to opportunities is not a rare event in Türkiye, HOI can be produced in all domains. Therefore, comparison over time and different domains is possible using TDHS data.

5.2 Sample Frame

In TDHS 1998, 2003, 2008 and 2013, the urban frame consisted of the provincial centers, district centers and other settlements that have populations of over 10.000. The rural frame, on the other hand, consisted of district centers, sub-districts and villages that are not in the urban frame. In these 4 TDHS administrative status did not play a role in determining urban and rural frames (HUIPS, 1999, 2004, 2004, 2014).

In TDHS 1993, the urban frame consisted of provincial centers, district centers and other settlements that have populations over 10.000 and the rural frame consisted of sub-districts and villages that are not in the urban frame. This definition left the district centers with a population of less than 10.000 unassigned to a frame. To overcome this problem, the administrative status is used, and all the remaining district centers are included in the urban frame (HUIPS, 1994).

In TDHS 2018, the urban/rural divide was not used as a design variable due to the enforcement of Law # 6360 in 2012 which transformed all the rural areas within metropolitan cities into urban quarters or districts. However, TDHS 2018 used the urban and rural divide as a survey variable and each cluster's urban/rural status was identified in line with its former administrative status and population size (HUIPS, 2019).

Initial information on all settlements in Türkiye was obtained from previous population censuses for TDHS 1993, 1998 and 2003. In TDHS 2008, 2013 and 2018, on the other hand, the initial information is acquired from the Address-Based Population Registration System (ABPRS) of the Turkish Statistical Institute.

5.3 Sample Implementation

The sample size of TDHS has grown over time. The number of completed household interviews has risen from 8,619 in 1993 to 11,794 in 2018. The household response rate remained high despite the fall in 2018. A similar pattern is also true for individual interviews. With the increase in the number of completed household surveys, the number of completed surveys at the individual level (i.e., ever-married women between ages 15 and 49) also increases. The individual response rate (or eligible women's response rate) remained around 90 percent except for 2018. These figures show that the data of this study comes from the household and individual surveys which have a high number of observations and a high response rate.

Table 5-2. Number of Interviews and Response Rate for TDHS

	# of Completed Household Interviews	Household Response Rate (%)	# of Completed Individual Interviews	Individual Response Rate (%)
TDHS-1993	8,619	96.8	6,519	95.0
TDHS-1998	8,059	93.8	6,512	92.7 (1)
TDHS-2003	10,836	92.9	8,075	95.6
TDHS-2008	10,525	88.4	7,405	92.5
TDHS-2013	11,794	93.3	9,746	89.9
TDHS-2018	11,056	79,2	7,346	81,1

(1) Recalculated for ever-married women to enable comparison.

5.4 Stratification

The stratification of TDHS got more complex over time. The number of strata had increased to reflect the introduction of the new NUTS regions and to have a better dispersion of the sample. In TDHS 1993, 14 sub-regions[81] were defined according to infant mortality rates of each province, estimated from the 1990 Population Census using indirect techniques (HUIPS, 1994). These 14 sub-regions were divided into

[81] These sub-regions defined in a way that they constituted the traditional five main regions in Türkiye.

urban and rural strata. Hence the number of strata in TDHS-1993 was 28. The stratification in TDHS-1993 was preserved in TDHS-1998. Therefore, TDHS-1998 also had 28 strata.

With the introduction of NUTS regions in Türkiye in 2002 and to provide estimates of some indicators for the ongoing UN-Habitat International Slum Survey, the stratification in TDHS 2003 changed. 40 strata were created to ensure consistency with the previous TDHS (HUIPS, 2004). Since it was not possible to construct five main regions from the newly introduced 12 NUTS 1 regions, some alterations were made to the boundaries of five main regions[82]. The 40 strata consisted of urban and rural stratum of 15 divisions (sub-regions), slum and non-slum strata of Istanbul and 4 strata for metropolitan cities (Adana, Ankara Bursa, İzmir) and 4 strata for regions hit by the 1999 Earthquake in Türkiye.

TDHS 2008 had a stratification that is based on that of TDHS 2003. In 2008, a total of 36 strata were created. These strata were urban and rural strata of 15 divisions and 6 strata for metropolitan cities (Adana, Ankara, Bursa, Gaziantep, İzmir, Konya) except Istanbul (because Istanbul itself was defined as a division). The same stratification approach was also administered in TDHS 2013.

TDHS 2018 had only 15 strata due to the inability to conduct stratification by urban and rural by the enforcement of law 6369 TDHS 2018. The 15 stratus are designed in a way that enables obtaining both the five main and 12 NUTS1 regions by aggregating them.

5.5 Questionnaires

DHS program uses four questionnaires to gather data, namely the household questionnaire, the woman questionnaire, the husband questionnaire and the biomarker questionnaire. The household questionnaire collects data on the characteristics (age, sex, education, etc.) of household members and visitors and the characteristics of the dwelling unit (safe water, sanitation, cooking facilities, assets of the household, etc.).

[82] 6 provinces (out of 81) were transferred to other regions.

The household questionnaire is also used for identifying eligible individuals (women or husbands) for further interviews. The woman questionnaire applies to women of reproductive age (15-49) and includes questions on background characteristics of women, “reproductive behavior and intentions, use and knowledge of contraception, antenatal and postnatal care, delivery, breastfeeding and nutrition, children’s health, the status of women, HIV and other sexually transmitted diseases and husband’s background. The eligible husband questionnaire asks for background characteristics, reproduction, knowledge and use of contraception, employment and gender roles, HIV and sexually transmitted diseases. Biomarker questionnaire collects data from children, women and men on anthropometry, availability of anemia and HIV. Additional modules on topics such as injury, adult and maternal mortality, disability, domestic violence, health expenditures, etc. are also available to incorporate into available questionnaires (DHS Program, 2019b).

All six TDHS used questionnaires that are based on standard DHS questionnaires. However, some minor alterations were made in the questions to capture country-specific dynamics. Furthermore, not all the standard questionnaires of DHS were used at each round of TDHS.

All TDHS except for 2008 employ only household and women questionnaires to collect data. The women's questionnaire was administered to ever-married women of reproductive age in TDHS 1993, 1998, 2003, 2008 and 2013. In TDHS2 2018, all women ages 15-49 who usually live in the selected households and/or were present in the household the night before the interview were interviewed. Unlike other TDHS, four questionnaires were administered in TDHS 1998: household, ever-married women, never-married women and husband. The never-married women questionnaire was based on the standard women questionnaire of DHS. Moreover, the anthropometric information of children was collected in all TDHS with the help of an additional module.

6. SELECTION AND CONSTRUCTION OF BASIC OPPORTUNITIES AND CIRCUMSTANCES

This chapter presents the opportunities and circumstances selected for this study and then discusses their definition, validity, and how they are constructed from TDHS data.

6.1 Basic Opportunities

As discussed in Chapter 4.1, opportunities are human capital investments that enrich an individual's abilities and options for future advancement in life. Opportunities should satisfy the following conditions to be valid (Barros et al.,2009 and Vega et al. 2012):

i. Affect the outcome of interest such as income, health or student performance,
ii. Critical from the human development perspective,
iii. Exogenous to the individual, but access is societally controllable,
iv. Unfairly affected by the circumstances, and
v. An existing national consensus regarding the universal provision of the opportunity.

The opportunities selected for this study are presented in Table 6-1. The study will analyze 18 opportunities that are grouped under the three categories: i) basic infrastructure (5 opportunities), ii) education (4 opportunities) and iii) health and nutrition (9 opportunities). The TDHS data allowed the construction of these opportunities for all six time points (1993, 1998, 2003, 2008, 2013 and 2018) with few exceptions. The exceptions are internet access (4 time points, TDHS 2003 and onwards), and access to postnatal visits (3 time points, TDHS 2008 and onwards).

Table 6-1. Summary of selected opportunities

Category	Opportunity	2018	2013	2008	2003	1998	1993
Basic Infrastructure	Access to water	✓	✓	✓	✓	✓	✓
	Access to sanitation	✓	✓	✓	✓	✓	✓
	Access to internet	✓	✓	✓	✓	✗	✗
	Access to computer	✓	✓	✓	✓	✓	✓
	Access to birth registration	✓	✓	✓	✓	✓	✓
Education	Starting primary on time	✓	✓	✓	✓	✓	✓
	Access to primary education	✓	✓	✓	✓	✓	✓
	Completion of primary on time	✓	✓	✓	✓	✓	✓
	Access to secondary education	✓	✓	✓	✓	✓	✓
Health Services and Nutrition	Access to antenatal visit	✓	✓	✓	✓	✓	✓
	i. Basic	✓	✓	✓	✓	✓	✓
	ii. Full	✓	✓	✓	✓	✓	✓
	Access to institutional skilled delivery	✓	✓	✓	✓	✓	✓
	Access to postnatal visits (child)	✓	✓	✓	✗	✗	✗
	Access to immunization	✓	✓	✓	✓	✓	✓
	Non-stunting	✓	✓	✓	✓	✓	✓
	Non-wasting	✓	✓	✓	✓	✓	✓
	Non-underweight	✓	✓	✓	✓	✓	✓
	Non-overweight	✓	✓	✓	✓	✓	✓

These opportunities are derived from the Sustainable Development Goals (SDGs). The SDGs are at the heart of the global agenda, and they provide a universal framework for countries, organizations, and individuals toward a more sustainable, just, and prosperous future for all. SDGs are a set of 17 interconnected global objectives adopted by 193 countries around the world to address the social, economic, and environmental challenges at the national and global levels. SDGs replaced Millenium Development Goals (MDGs) and provide a more comprehensive approach to eradicating poverty, ensuring inclusive and equitable quality education, promoting health and well-being, reducing inequalities, achieving gender equality, fostering sustainable economic growth, and combating climate change, among other critical issues. All of the selected opportunities in Table 6-1 are directly linked with SDGs, they can either directly or indirectly be inferred from SDGs and SDG targets or they are already defined as an indicator to monitor the progress in the SDGs framework.

The opportunities can also be derived from DHS (TDHS in this study) which is among the data sources for monitoring SDGs. The relation between SDGs and selected opportunities will be analyzed in more detail in the following part, especially when establishing the existence of a societal consensus on the universal provision of the selected opportunities.

The definition and the validity of the selected opportunities are discussed in the following section.

6.1.1 Definition of Selected Opportunities and Circumstances

This section discusses the definition of the selected opportunities. Clearly, data availability was an important factor in the determination of how each opportunity is defined. The definitions are based on international standards and the DHS Guide whenever the data allows. However, there were some instances when the available data did not allow to employ the global standards. For example, the categories were not always in line with the DHS Guide for indicators such as safe water and improved sanitation. In addition, the schooling indicators are constructed considering the schooling age in Türkiye when the TDHS was conducted. For example, the age group that is expected to attend secondary education was 14-16 until 2012, and 14-17 after 2012. Similarly, the list of vaccines has changed over time in Türkiye. Therefore, the definition of access to immunization was modified to reflect this change. The details are presented below.

6.1.1.1 Basic Infrastructure

Water and sanitation

Both access to water and sanitation are defined in line with the definition used by the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP, 2018).

Access to water is defined in a way that it measures the availability of safe and clean drinking water within reach, hence access requires meeting two criteria simultaneously. To have access, the water source needs to be improved and the amount

of time that is typically required to reach the water source should be no more than more than 30 minutes by foot (round trip). Improved drinking-water sources are those that are protected from outside contamination. The details of improved water sources are presented in Table 6-2. Hence, access to water is defined as "1" if the source of drinking water is improved and the time to the source is less than 30 minutes (either on-premises or 1-29 minutes of travel time). Otherwise (if the water source is unimproved or the duration to the source is more than 30 minutes), access to water is defined as "0" which represents non-access. This definition is used for all years except 1993 when the data for time to source was not available, therefore the analysis for 1993 considers only the type of drinking water source. This opportunity is constructed and analyzed for children of all ages (0-17).

A similar approach is employed for access to sanitation. To have access, the sanitation facility should be improved and not shared with other households. The sanitation facility is identified as improved if human waste is hygienically separated from human contact. The detailed classification of improved and unimproved sanitation facilities is presented in Table 6-3. Hence, access to sanitation is defined as "1" if the sanitation facility is improved and it is not shared with other households. Otherwise (if the sanitation facility is unimproved or used jointly with other households), access to sanitation is defined as "0" which represents non-access. This definition is used for all years except 1998 in which the data for shared use of the facility was not available, therefore the analysis for 1998 considers only the type of sanitation facility. This opportunity is constructed and analyzed for children of all ages (0-17).

Table 6-2. Classification for improved and unimproved water source

First level classification	Second level classification	Improved	Unimproved
Tap water	Piped water into dwelling	X	
	Piped water to yard/plot	X	
	Public tap, standpipe	X	
	Other	X	
Ground water	Tubewell, borehole	X	
	Protected well	X	
	Protected spring	X	
	Unprotected well		X
	Unprotected spring		X
Rainwater	Covered cistern/tank	X	
	Uncovered cistern/tank	X	
Packaged water*	Bottled water	X	
	Sachet water	X	
Delivered water*	Cart with small tank/ drum	X	
	Tanker truck provided	X	
Surface water	River		X
	Lake		X
	Dam		X
	Pond		X
	Stream		X
	Irrigation channel		X
Other	Other improved	X	
	Other unimproved		X
DK/Missing			X

Source: JMP (2018)

Table 6-3. Classification for improved and unimproved sanitation facilities

First level classification	Second level classification	Improved	Unimproved
Flush toilets	to piped sewer system	X	
	to septic tank	X	
	to pit	X	
	to unknown place/not sure/DK	X	
	to open drain		X
	to elsewhere		X
Pour flush latrines	to piped sewer system	X	
	to septic tank	X	
	to pit	X	
	to unknown place/not sure/DK	X	
	to elsewhere		X
Dry latrines	Ventilated Improved Pit latrine	X	
	Composting toilets	X	
	Pit latrine with slab	X	
	Pit latrine without slab/ open pit		X
	Hanging toilet/hanging latrine		X
	Bucket latrine		X
No facility	Bush, field		X
Other	Other improved	X	
	Other unimproved		X
DK/Missing			X

Source: JMP (2018)

Access to computer and internet

The definition of access to computer and internet is straightforward. These indicators look at whether there is a computer and internet connection at the dwelling. Access to computer is defined as "1" (access) if there is at least one computer in the dwelling and "0" (non-access) if otherwise. Internet access is defined in the same way. However, the available data does not allow identification of whether children are

actually using these services to enrich their choices. Therefore, the analysis cannot capture the actual utilization of the opportunity and should be interpreted as an upper limit of access since some of the children may not be benefiting from computers or the internet even though these services are available at home. The data for computer availability at home is available for all years. However, the data on internet connection at home is available for the years 2003, 2008, 2013, and 2018. This opportunity is analyzed for children between ages 6 and 17.

Birth registration

Access to birth registration takes the value of "1" (access) if the child is registered to the population registry system, and it is "0" (non-access) if the child is not registered to the population registry. The TDHS 2003, 1998 and 1993 did not ask directly whether the child is registered, however, these surveys included information on whether the child has an identity card or not. This information is used for these years and the variable takes the value "1" (access) if the child has an identity card, and "0" (non-access) if not. This opportunity is analyzed for children ages under 5.

6.1.1.2 Education

The opportunities related to education are constructed in line with the Turkish education system. This includes the overtime changes related to the age and duration of education level. Primary education covers the first 8 years of education (primary school and junior high school[83]) which was designated as 5+3 years until 2012 and 4+4 after then. The secondary school refers to the high school level of education which had a regular duration of 3 years until 2012 and was extended to 4 years after 2012 with the extension of mandatory education schooling from 8 to 12 years.

[83] The terminology of school levels is based the terminology used in MoNE (2007).

Starting primary education on time

This variable is equal to "1" (access) if the child is enrolled in primary education at the age of 6 or 7. If the child is not enrolled in education at these ages, then the assigned value is "0" indicating non-access.

Access to primary education

Access to primary education requires the enrollment in primary education of a child between the ages of 6 and 13. Hence, the variable takes the value of "1" (access) if this condition is satisfied, and "0" (non-access) if the condition is not satisfied. The children within the age group who completed primary education were not included in the analysis.

Completion of primary on time

This indicator looks at whether children of ages 14 and 15 have graduated from primary education. It takes the value of "1" (access) for those who completed primary education until age 15. This indicator is included in the analysis as a proxy of quality of education since it is not possible to capture educational quality directly from TDHS data. The available literature indicates that a well-structured curriculum, skilled teachers, support systems, adequate resources, monitoring, and supportive policies collectively ensure students' completion of their education on time. However, this indicator fails to capture whether the child actually gained the necessary skills, and therefore it is an indirect indicator of education quality.

Access to secondary education

Access to secondary education variable is defined in a way that it takes the value of "1" (access) if the child in the appropriate age group is enrolled in secondary school and it is equal to "0" (non-access) if otherwise. The appropriate age group is 14-16 for years before 2012 and it is 14-17 for 2013 and 2018. Children in these age groups who have graduated from high school or continue primary level education were not included in the analysis.

6.1.1.3 Health and Nutrition

Access to basic and full antenatal visit

This indicator combines the number of antenatal visits, the timing of the antenatal visit, and the person who provided the antenatal care service into a single variable. Access to "basic" antenatal care requires that; the mother had at least one visit, the first visit is within the first three months of pregnancy and the care service is provided by a trained medical staff (doctor, nurse, or midwife). Access to "full" antenatal care is defined as the mother having at least four antenatal visits, the first one being within the first three months of pregnancy and all the antenatal care services are delivered by a trained medical staff. Hence, the only difference between basic and full antenatal care services is the number of visits (at least one versus at least four). These opportunities are analyzed for children ages under 5.

Access to institutional skilled delivery

Access to institutional skilled delivery looks at the place of delivery and the person who delivered the baby. To have "access" to this opportunity; i) the place of delivery needs to be a health facility including (private or public) hospitals, maternity houses, health centers, health houses, private doctor's offices, or similar, and ii) the delivery should be provided by a trained medical staff (doctor, nurse or midwife). This opportunity is analyzed for children ages under 5.

Access to postnatal visits (for the child)

This opportunity takes the value of "1" (access) if the newborn received a postnatal check by a trained medical staff within the first two days of the delivery. It is recorded as a non-access if at least one of the following did not happen: i) the child did not receive a postnatal check or ii) the child did receive a postnatal check, but the visit was later than the first two days of delivery or iii) the check was not provided by a trained medical staff. This opportunity is analyzed for children ages under 5.

Access to immunization

This indicator looks at whether the child has received all the age-appropriate vaccines (full immunization) in line with the schedule of vaccinations at the time of the survey. The list of age-appropriate vaccines was received from each TDHS report which is identified in line with the Ministry of Health's vaccine list. The list of vaccines in each TDHS is presented below. The indicator takes the value of "1" if the child received all the age-appropriate vaccines and "0" if not.

Table 6-4. List of age-appropriate vaccines needed for full vaccination.

Year	Vaccines
2018	BCG, three doses of DTaP-Hib-IPV, three doses of hepatitis B, two doses of OPV, three doses of PCV, one dose of MMR, one dose of varicella and two doses of hepatitis A
2013	BCG, MMR, and three doses each of DTaP-IPV-Hib, Hepatitis B, and PCV
2008	BCG, Measles, three doses of DPT and polio
2003	BCG, Measles, three doses of DPT and polio
1998	BCG, Measles, three doses of DPT and OPV
1993	BCG, Measles, three doses of DPT and OPV

Source: TDHS Reports for 1993, 1998, 2003, 2008, 2013 and 2018.

Non-Stunting, non-wasting, non-underweight and non-overweight

All opportunities related to nutritional status are constructed in line with the international standards which are also employed in all TDHS. The z-scores used in the analysis are calculated in line with the NCHS/CDC/WHO international reference standards and the z-scores are available in all 6 TDHS. Access is defined as a positive nutritional status, i.e., non-stunting instead of stunting. Hence access requires the z-score of;

- height-for-age to be higher than or equal to -2 standard deviation for non-stunting,
- weight-for-height to be higher than or equal to -2 standard deviation for non-wasting,

- weight-for-age to be higher than or equal to -2 standard deviation for non-underweight and
- weight-for-height to be lower than or equal to +2 standard deviation for non-overweight.

All the other cases are defined as non-access and analyzed accordingly. This opportunity is analyzed for children ages under 5.

6.1.2 Validity of Selected Opportunities

This section will establish the validity of selected opportunities by analyzing their effect on the final outcomes and human development, their exogeneity status, how they change with circumstances and whether there exists a societal consensus on the universal provision.

6.1.2.1 Effect on the outcome and critical for human development

Access to water and sanitation has a profound effect on various outputs including human development. Available literature indicates that children living under inadequate conditions without access to safe water and poor sanitation face heightened risks of health problems such as diarrhea, respiratory infections, and typhoid fever. Additionally, children may endure acute malnutrition, resulting in hindered growth and developmental setbacks. Moreover, deficient water and sanitation conditions can hinder educational access such as student absence due the illnesses, increased house care responsibilities, and impairing cognitive skills. These factors eventually hurt human development prospects by crippling lifetime opportunities and the well-being of children who are exposed to these factors. (see Jasper et al., 2012; Mills & Cumming, 2016; McMichael, 2019; WHO, 2018)

Access to computers and the internet significantly influences the development process of children by serving as pivotal tools in their education. These technological resources enhance children's access to educational materials and diverse learning platforms and foster digital literacy which is critical in the digitalized world. The use of computers and the internet enables children to reach the global repository of information, stimulating self-directed learning, promoting cross-cultural awareness,

and bridging them with the world. Moreover, these resources possess the potential to mitigate socio-economic disparities by providing equitable educational opportunities for children across diverse socio-economic backgrounds. Ultimately, computers and the internet, when used the right way, help children acquire the competencies essential for academic achievement, personal growth, and future success in an increasingly interconnected and technology-centric world (see Fairlie, 2005; Fairlie et al., 2010; Malamud & Pop-Eleches, 2011; Fairlie & Kalil, 2017; Malamud, 2018). According to the PISA results in 2018, children who have a computer at home for school work score significantly higher than children without a computer at home in reading, mathematics and science (around 60 points higher in all tests). The same assessment indicates even higher gaps between children who have access to the internet at home and those who do not (89, 77 and 76 points for reading, mathematics and science respectively) (NCES, 2021).

Birth registration provides formal recognition of a child's birth, serving as authorized documentation of a child's existence. In addition to being a basic human right itself, it directly influences children's enjoyment of other basic rights. In other words, it provides a legal identity and enables the recognition of a child as a citizen and grants access to various opportunities, including healthcare, education, social services, and legal protection. Furthermore, it enhances social inclusion and EOP by providing equal access to services and opportunities for all, reducing the risk of marginalization or exclusion. Lack of birth registration and legal identity increase the risk of exploitation for children such as trafficking, child labor, early-age marriage, family separation, illegal adoption and statelessness. Hence, the lack of birth registration cripples access to opportunities and impairs future prospects and human development. (see. Todres, 2003; UNICEF, 2008; UNICEF, 2013; UNICEF, 2019a; UNICEF, 2019a)

Education equips individuals with vital knowledge, skills, and competencies crucial for personal growth and success and it is a crucial element of human development. Indeed, access to education and acquiring the skills needed to live a prosperous and healthy life is a part of the definition of human development. The first

Human Development Report (HDR 1990) defined human development as follows: "*Human development is a process of enlarging people's choices. …the three essential ones are for people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living…Human development has two sides: the formation of human capabilities such as improved health, knowledge and skills - and the use people make of their acquired capabilities - for leisure, productive purposes or being active in cultural, social and political affairs."*(UNDP, 1990). Education serves as a catalyst for economic advancement. It enhances employability, job opportunities, and income potential leading to economic growth both at the individual and country level. It has benefits that go beyond economic implications. It is intertwined with health and well-being, fostering healthier lifestyles and improved health outcomes by promoting essential health knowledge and practices. It also enhances civic engagement, participation in democratic processes and societal development. Furthermore, it serves as a powerful tool to fight against inequalities by addressing the cycle of poverty, empowering left-behind groups and advancing gender equality. (see. Schultz, 1961; Ross & Wu, 1995; Hill & King, 1995; Goetz, 2004)

Antenatal care (ANC), institutional skilled delivery and postnatal care (PNC) can be considered as the continuum of health care which is crucial for the health and wellbeing of children as well as mothers. Antenatal care enables monitoring the health of expectant mothers, identifying potential risks during pregnancy and addressing them if any. It also promotes healthy behaviors and proper nutrition and prepares mothers for childbirth. Deliveries at health facilities by a doctor or a nurse significantly decrease the risk of maternal mortality and neonatal mortality rates by reducing birth-related complications and enabling prompt response to complications when they occur. Postnatal hospital visits are continuity of health care and are crucial for the health and well-being of newborns and mothers. These visits ensure monitoring and assessing the health and well-being of both the newborn and mother after childbirth. PNC allows healthcare providers to detect and address any health concerns at an early stage, thereby preventing more serious health issues. It is also beneficial in terms of guiding mothers on childcare and supporting the health of mothers. To sum up, the combined efforts of antenatal care, institutional delivery, and postnatal care form a continuum

that is essential for ensuring the health and well-being of children. These services not only contribute to safer pregnancies and childbirth but also promote healthy growth and development in the crucial early stages of a child's life. (see. Evans & Lien, 2005; Fort et al., 2006; Wang et al., 2011; Noonan et al., 2013; WHO, 2016; NICHD, 2017; Benova et al., 2018; McCauley et al., 2022)

Similar to health care services during and after pregnancy (ANC and PNC), immunization is critical for children's health and development. Immunization significantly lowers child mortality, prevents diseases, supports physical growth, preserves cognitive and educational abilities, fosters social and emotional well-being, and provides long-term health benefits that extend into adulthood. These benefits collectively contribute to healthier and more prosperous lives for vaccinated children (see Arsenault et al., 2020; Nandi & Shet, 2020; HHS, 2021; UNICEF, 2023a). According to WHO (2023), the available vaccines prevent more than 20 life-threatening diseases, and research indicates that vaccination saves the lives of 4.4 million children every year around the globe (UNICEF, 2023a). Furthermore, vaccination of children has a much wider positive impact on the community -even on those who did not vaccinate- by promoting herd immunity. In some cases, these externalities are intergenerational erasing some diseases from existing such as polio (UNICEF, 2023b). The rate of return on immunization is also very high, with every USD 1 invested in immunization returns an estimated USD 16 in the form of healthcare savings and increased economic productivity (UNICEF, 2023c).

Stunting, wasting, overweight, and underweight are good indicators of malnutrition under age 5. World Health Organization (WHO) utilized these indicators to monitor malnutrition at the national and global level (see. WHO, 2017; WHO, 2018a). The impact of malnutrition on children's development outcomes is well-documented. It is classified as the single most important threat to health (Mach et al., 2000). Malnutrition is the leading cause of child mortality accounting for 45 percent of deaths among children under 5 globally (WHO, 2021). Malnutrition in children contributes to weaker immune systems, increased susceptibility to infections, and long-term health impacts such as stunting, affecting motor and cognitive development

irreversibly. From an economic perspective, malnutrition cripples productivity, human resources, and overall economic progress. The mortality and illness associated with malnutrition directly diminish human resources and productivity. Additionally, inadequate cognitive abilities and lower educational achievements stemming from childhood malnutrition impede economic advancement. Health issues persisting from early childhood undernourishment also add pressure on healthcare systems, leading to escalated healthcare expenses. The economic impact of malnutrition, estimated to range between 2 to 16 percent of GDP in impacted nations, perpetuates ongoing poverty from one generation to another. (see UNICEF, 1998; European Union, 2014; Biesalski & Black, 2016; UNICEF, 2019b)

6.1.2.2 Exogeneity

The exogeneity of the selected opportunities is straightforward in the case of children. As discussed in Chapter 4.1, exogeneity requires uncontrollable access to opportunities at the individual level. Children cannot control or make an effort to access the selected opportunities. The housing conditions (safe water, sanitation, internet, etc.) are all beyond the control of the child. This logic can easily be extended to the case of opportunities related to health services and nutrition. Obviously, the child has no control over access to ANC, PNC, delivery place, whether s/he will be vaccinated or not and the type and amount of food s/he is provided with. The exogeneity in the case of starting primary on time and primary education enrollment is also straightforward since children do not get to choose when or whether they enroll in primary school. However, the exogeneity of completing primary school on time and secondary school enrollment is somehow more complicated since someone can argue that these two have some effort element in them. Children are expected to exert some effort to graduate from school on time and continue to secondary school for which graduation from primary school is a prerequisite. However, in most cases, primary school education is designed to be manageable for children with age-appropriate content and teaching methodologies and, with adequate support from parents and teachers, the majority of children do not have any problem navigating through primary education. Therefore, the effort element in these two opportunities is weak and it is safe to assert that these two opportunities satisfy the exogeneity condition.

Access to these opportunities is also societally controllable. Governments and communities can control access to basic infrastructure, education and health and nutrition, if they want to, in various ways including infrastructure investments, vaccination campaigns. making services free, providing incentives for vulnerable groups, enforcing legislations, etc. For example, in Türkiye, schooling rates have increased significantly in the last 30 years due to investments in education, the extension of mandatory education first to 8 and then to 12 years and organizing specific campaigns that target left behind groups such as girls, and refugees. Similar phenomena hold for all the opportunities. Hence, the society has the means to control the access to all these opportunities.

6.1.2.3 Unfair affection by the circumstances

As discussed in Section 4.1, circumstances are socially determined personal, family, or community characteristics over which children do not have control. It is obvious that the selected circumstances (namely sex of the child, mother's tongue, the education level of parents, household size, household wealth, region, and the type of place of residence), to which a child was born and lives with, affect access to the selected opportunities. The studies investigated in the literature review part of this study also clearly indicate that there are many circumstances (including those which are selected for this study) that have an impact. For example, according to TDHS 2008, the access to improved water sources is 93.7 percent for households living in urban areas and 88.4 percent for households living in rural areas (HUIPS, 2009). Similarly, the access to improved sanitation differs by almost 55 percentage points between households living in urban and rural areas. In THDS 2003, the type of place of residence is associated with 7 times increase in household access to computers and the internet (HUIPS, 2004). The same study also found that the vaccination rate changes significantly by education level of the mother (26.1 percent vs. 68.5 percent for mothers without any formal education and with high school or higher level of education), region (63 percent in west region vs. 34.8 percent in east region) and sex of the child (57.7 and 50.6 percent for boys and girls). These examples can be extended to all the selected opportunities.

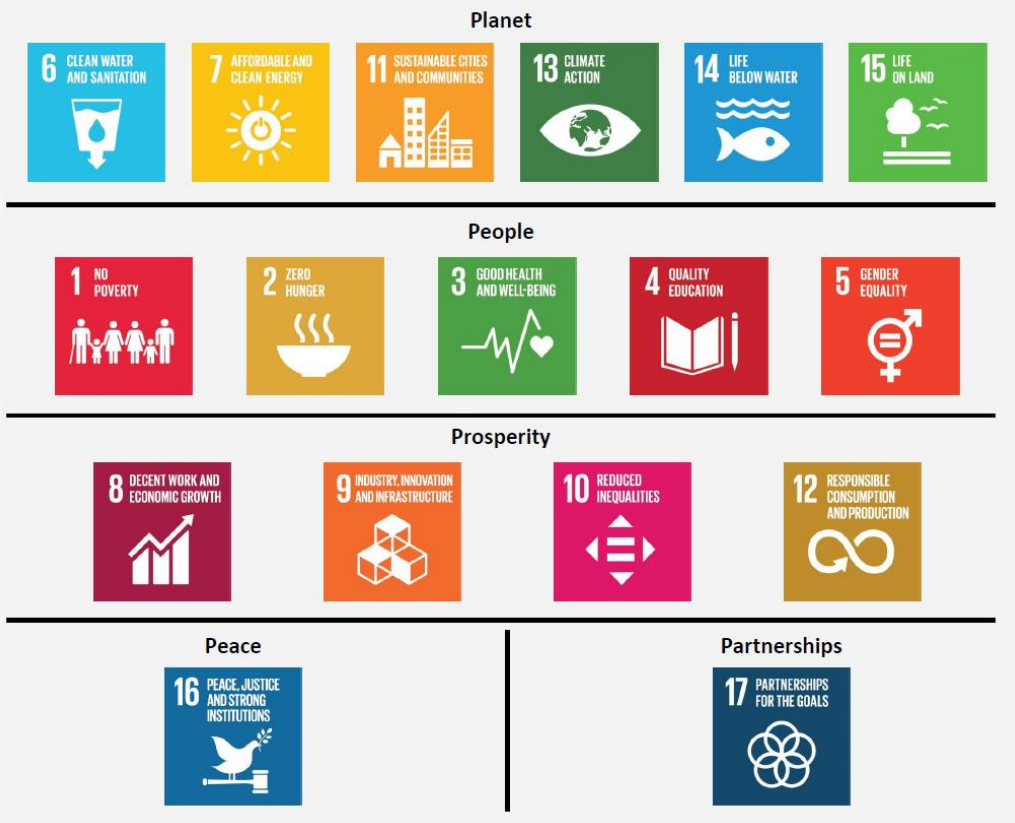
6.1.2.4 Consensus on universal provision

Barros et al. (2009) established the basic set of criteria for a good or service to be an opportunity. The same researchers suggested one more criterion in their study in 2012. According to Vega et al. (2012), there should be a national consensus regarding the universal provision of opportunity. The opportunities for each society can be identified from national documents (constitution, available legislations, or national development plans) and international documents that are adopted by national governments. This study looks at the latter, namely the Sustainable Development Goals (SDGs), to establish that there exists a consensus although it can also be done through looking at the national documents. The main reason behind this is that the opportunities are already selected from the SDGs.

The well-known SDGs are a set of interlinked goals that aim to transform the world by 2030 by addressing available social, economic, and environmental challenges. The SDGs concept is based on the "Leave No One Behind" principle and consists of 17 goals structured under 5 pillars. These pillars are People, Prosperity, Planet, Peace and Partnership. The first pillar, namely People, aims at "*ending poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfill their potential in dignity and equality and in a healthy environment*". SDGs 1 through 5 are located under this pillar. The second pillar (Planet) contains SDGs 6, 7, 11,13,14 and 15 and aims to "*protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.*" The Prosperity pillar tries to "*ensure that all human beings can enjoy prosperous and fulfilling lives and that economic, social and technological progress occurs in harmony with nature*" and contains SDGs 8, 9, 10 and 12. The fourth pillar, namely Peace, targets "*peaceful, just and inclusive societies which are free from fear and violence*" with the SDG 16. The Partnership pillar and SDG 17 envisage "*mobilizing the means required to implement this Agenda through a revitalised Global Partnership for Sustainable Development, based on a spirit of strengthened global solidarity, focussed in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all*

people."(UNDESA, 2023). These pillars are strongly interlinked, and synergies exist between the different pillars and goals. The SDGs have targets and indicators under each goal (169 targets and 231 indicators in total) to make the Agenda more actionable and to be able to monitor the progress[84].

Figure 6-1 Five pillars and 17 SDG



Source: SKG (2018)

The SDGs replaced the Millennium Development Goals (MDG) in the global development agenda and were adopted at the UN Sustainable Development Summit in New York in September 2015 by 193 Countries. Türkiye is among the 193 countries that adopted the agenda and declared its commitment to achieving the goals. The spirit of SDG is also included in the 10th, 11th, and 12th National Development Plans of Türkiye. The Report on Turkey's Initial Steps towards the Implementation of the 2030

[84] The list of targets and indicators are available at: https://unstats.un.org/sdgs/indicators/indicators-list/#:~:text=The%20global%20indicator%20framework%20includes,of%20SDG%20indicators%20is%20248.

Agenda for Sustainable Development of the Ministry of Development of Türkiye states that "*The recent 10th Development Plan of Turkey has placed sustainable development at its core with a human-centered development approach. The 10th Development Plan has reflected the economic, social and environmental dimensions of sustainable development in a balanced way … Having a strong ground for sustainable development at the highest level policy document, Turkey is completely dedicated to operationalize 2030 Agenda for Sustainable Development in line with its national circumstances. By this endeavor, Turkey is committed to take the SDGs as a critical input when drafting the vision of the next Plan and to integrate SDGs into the 11th Development Plan.* (MoD, 2016)*"*. In this respect, the 11th Development Plan (2019-2023) of Türkiye included a dedicated section for SDGs which sets the reflection of SDGs into national policies as a main objective (SBB, 2019, paragraph 842). This approach was continued in the 12th Development Plan (2024-2028) and the significance of SDGs in the national development agenda was highlighted in paragraphs including but not limited to 166, 245, 350, 864, 981 (SBB, 2023). In addition, the President of Türkiye declared Türkiye's strong commitment to achieving the SDGs in the Foreword of Türkiye's 2nd National Voluntary Review with the following words: "*Turkey has emphasized its commitment on every occasion to contribute to a sustainable world since the adoption of Agenda 2030…. We are working tirelessly to achieve our goals for 2023 and we will achieve these goals through the principles of sustainable and human-centered development*" (SBB, 2019b).

The findings in the previous paragraph indicate that there is a consensus in achieving the SDGs in Türkiye. The following part will establish the connection between the selected opportunities and SDGs.

SDGs are constructed around the "Leave No One Behind" principle to create a more inclusive, equitable, and sustainable world by 2030. This principal places efforts addressing the left-behind groups at the heart of the sustainable development process and tries to ensure that everyone enjoys the benefits of development. It also emphasizes that sustainable development cannot be achieved without ensuring everyone's

contribution to the sustainable development journey. This approach requires the elimination of disparities among different groups by providing fair and equal access to resources, services, and opportunities for all individuals, irrespective of their circumstances. Hence, the objective is to create a level playing field where everyone has an equal chance to thrive and contribute to society which is also the definition of EOP.

The sustainable development process is highly dependent on achieving EOP. Recognizing this fact, SDGs do not strive only to make sure that everyone has access to basic goods and services but also include two specific goals that address equality and IOP. SDG 10 directly aims at reducing inequalities within and among countries. Progress in SDG 10 calls for efforts to address the root causes of inequality. In this respect, SDG 10 specifically targets "*ensuring equal opportunity and reducing inequalities of outcome* (Target 10.3)" and "*empowering and promoting the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status* (Target 10.2)".

In addition to SDG 10, SDG 5 (Gender Equality) specifically aims at achieving gender equality recognizing that women are left behind in access to opportunities and productive resources. This Goal advocates for *"ending all forms of discrimination against all women and girls"* (Target 5.1), *"ensuring women's full and effective participation and equal opportunities for leadership"* (Target 5.5) and *"undertaking reforms to give women equal rights to economic resources*" (Target 5.a).

Access to water and sanitation

The SDGs have a direct reference to this opportunity. SDG 6 aims to *"ensure access to water and sanitation for all"*. Specifically, Target 6.1 *("by 2030, achieve universal and equitable access to safe and affordable drinking water for all")* and Target 6.2 *("by 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations")* address the significance of having access to

clean water and adequate sanitation facilities in improving health, poverty reduction, and supporting sustainable development.

Access to computer and internet

Children's access to computers and the internet is not explicitly included as a specific goal within the SDGs. However, two targets highlight its importance in sustainable development. Target 9c under SDG 9 (Industry, Innovation and Infrastructure), aims at increasing access to information and communications technology and strives to provide universal and affordable access to the internet. Similarly, SDG 17 (Partnership For the Goals) targets *"enhancing the use of enabling technology, in particular information and communications technology"* (Target 17.8) and uses the "Proportion of individuals using the Internet" as an indicator for this target. In addition, access to computer and internet is recognized as a crucial enabler and contributor to achieving several goals in the SDGs context. For example, SDG 4 (Quality education) targets "*increasing the share of youth with relevant technical and vocational skills, for employment, decent jobs and entrepreneurship"* (Target 4.4) and identifies "proportion of youth and adults with information and communications technology (ICT) skills" as an indicator to measure the progress in this area. It also supports SDG 8 (Decent Work and Economic Growth) since access to technology helps the creation of employment opportunities and improves productivity, contributing to sustainable economic development. Furthermore, it also contributes to the reduction in inequalities (SDG 10, and SDG 5) by addressing the digital divide and enhancing access to opportunities. Hence, societies, including Turkish society, strive to provide children with safe and equitable access to technology, enabling them to enjoy its benefits for education, skill development, and future opportunities, thereby contributing to the achievement of multiple SDGs.

Access to birth registration

As discussed, birth registration plays a key role in accessing basic goods and services. SDGs recognize the importance of birth registration as a fundamental human right and a key enabler for various goals. SDG 16 ("Peace, Justice and Strong

Institutions") targets *"providing legal identity for all, including birth registration*" (Target 16.9) and uses the "proportion of children under 5 years of age whose births have been registered with a civil authority" as a progress indicator (16.9.1). It further contributes to SDGs 3 and 4 by enabling access to education and health services which are critical for human development and social and economic development.

Access to education (starting primary on time, access to primary education, completion of primary on time and access to secondary education)

Education is an integral part of sustainable development. The 2030 Agenda recognizes this fact and includes SDG 4 (Quality Education) as a stand-alone goal which promotes inclusive and equitable quality education for all. To operationalize this goal, SDG 4 specifically targets; *"ensuring that all girls and boys complete free, equitable and quality primary and secondary education (Target 4.1), increasing the number of youth who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship (Target 4.4), eliminating gender disparities in education and ensuring equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations (Target 4.5), and ensuring that all learners acquire the knowledge and skills needed to promote sustainable development (4.7)".* The indicator of these targets coincides with the selected educational opportunities in this study[85]. In addition, access to education contributes to many other SDGs such as SDG 1, 2, 3, 5, 8, and 10 as well as all the others.

Access to basic maternal health care services (Antenatal Care, institutional skilled delivery postnatal care and immunization)

Antenatal care, institutional skilled delivery, postnatal care, and immunization are essential components of maternal and child health services and are interconnected

[85] *"Indicator 4.1.2. Completion rate (primary education, lower secondary education, upper secondary education); Indicator 4.1.1 Proportion of children and young people (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics; Indicator4.5.1 Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators"*

with numerous SDGs aimed at promoting health and well-being. SDG 3, namely Good Health and Well-being, directly addresses the health and well-being of children. Targets 3.1 and 3.2 under this SDG aim at reducing maternal and child mortality which are closely linked with the selected opportunities. Similarly, Target 3.3 envisages combatting hepatitis which is among the vaccines that are used in the construction of the access to immunization opportunity. Target 3.8 promotes *"universal health coverage, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all*". Furthermore, Target 3.b promotes the development and provision of vaccines for all. The directly related indicators under these targets are *"3.1.2 Proportion of births attended by skilled health personnel; 3.3.4 Hepatitis B incidence per 100,000 population; 3.8.1 Coverage of essential health services; 3.b.1 Proportion of the target population covered by all vaccines included in their national programme*".

The provision of universal access to the selected opportunities also contributes to other SDGs such as SDG 2 by contributing to the reduction in malnutrition by ensuring healthier pregnancies, births, and childhood development; SDG 4 by supporting children's health and cognitive skills and development, SDG s1 by enhancing the productive potential of the children and SDG 5 and 10 by fostering the reduction in inequalities.

Access to good nutrition (non-stunting, non-wasting, non-underweight and non-overweight)

Improving the nutritional status of children aligns with several SDGs and fosters sustainable development due to its critical role in ensuring good health, well-being, and overall development. SDG 2 (Zero Hunger) directly targets malnutrition by promoting food security and improved nutrition for all. Specifically, Target 2.1 highlights *"ending hunger and ensuring access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round"* for sustainable development. Similarly, Target 2.2 specifically underlines combat against stunting and wasting in children by targeting "ending all forms of malnutrition, including achieving, the internationally agreed targets on

stunting and wasting in children under 5 years of age". Additionally, the following indicators are employed to measure the progress in this goal: *"2.1.1 Prevalence of undernourishment, 2.2.1 Prevalence of stunting (height for age <-2 standard deviation among children under 5 years of age, 2.2.2 Prevalence of malnutrition among children under 5 years of age, by type (wasting and overweight)"*. These indicators are the same as the selected opportunities in this study. Moreover, nutrition contributes to health (SDG 3) and education (SDG 4) in the short and long run, and SDG 1, 5, 8, 10, 16 ((End Poverty, Gender Inequality, Decent Work and Economic Growth, Reduced Inequalities and Peace, Justice and Strong Institutions) in the long run as previously discussed in this chapter.

6.2 Circumstances

As explained in Chapter 4.1, circumstances are the various factors or conditions that children are born into or encounter throughout their lives, which can significantly impact their ability to access opportunities. The circumstances are beyond the control of children and there is an agreement in the society they live in that the circumstances should not affect the outcomes.

Table 6-5. List of selected circumstances

Type	Circumstances	Breakdowns
Demographic	1. Sex of child	Female, Male
	2. Household size	(1-4), (5-7); (8 or more)
Socio-economic	3. Parental education: at least one of the parents completed high school or higher	Yes; No
	4. Mother tongue: Language usually used when partners talk to each other	Non-Turkish, Turkish
	5. Wealth	Poorest; Poorer; Middle; Richer; Richest
Geographic	6. Region	West; South; Central; North; East
	7. Type of place of residence	Urban, rural

The circumstances employed in this study are selected by i) investigating previous studies to find the commonly used circumstances, ii) examining the correlation between the potential circumstances and iii) calculating HOI multiple times

using a different set of circumstances to compare the changes. As a result of these, seven circumstances were identified[86] (see Table 6-5) and all the analyses were performed using this set of circumstances. These circumstances are also categorized into three groups, namely demographic, socioeconomic, and geographic to identify these categories' contribution to the inequality in addition to the contribution of single circumstances.

As presented in Table 6-5, some of the circumstances, namely sex of the child, wealth, region and type of place of residence, are defined the same way they are defined in TDHS. Accordingly, the sex of the child has two breakdowns: female and male. Wealth is divided into 5 categories: poorest, poorer, middle, richer and richest. Similarly, west, south, central, north and east constitute the regions that are employed in the analysis. The type of place of residence has two breakdowns: urban and rural.

The remaining circumstances are constructed or categorized based on other variables in TDHS. TDHS data already has a household size variable which is numerical. For this study, this variable is recoded into three categories: households with less than 5 members, households with a number of members between 5 and 7, and households with 8 or more members. Parental education looks at whether one of the parents has completed high school or a higher level of education, hence it is constructed using the mother's and father's education level and has two categories (yes, no).

As for the mother tongue, TDHS does not directly ask this question, however, it asks the mother what language she usually uses when talking with her partner. The mother tongue variable is constructed based on this question and has two categories: non-Turkish and Turkish. The non-Turkish category is obtained by merging all languages other than Turkish (Kurdish, Arabic and others) into one category. The TDHS 1998 did not ask for the language mother and father talk to each other. Therefore, a different approach is used for this year. The mother tongue variable is

[86] Some circumstances not employed in the study are sex of the household head, presence of both parents in the household, number of siblings at home, birth order, mother's education level and mother's employment status, among others.

constructed using the mother tongue of the mother and father, and it is assumed that if both the mother's and father's mother tongue are different than Turkish, then the mother tongue of the child is non-Turkish. If at least one of the parent's mother tongues is Turkish, then the mother tongue of the child is assumed as Turkish.

6.3 Chapter Summary

This chapter discussed the opportunities and circumstances that are used in the analysis of IOP in Türkiye in the next Chapter. 18 opportunities are selected for this study (see Table 6-1). All these opportunities are derived from the SDGs framework. They were either directly stated in the goals or targets or implied by them. In some cases, they were identified as an indicator of a goal or a target to measure the progress. The opportunities were defined in line with the international standards that are used by the DHS Program, but some are modified according to the Turkish Context or data availability. The chapter has also established the validity of the opportunities by

- showing that they influence the final outcome (income, health, school performance, etc.) and human development;
- establishing their exogeneity by demonstrating that they cannot be controlled by the children, but society can control access to them;
- indicating that they are affected by the circumstances; and
- demonstrating that there is a societal consensus on the universal provision of these goods and services by using the SDGs framework.

Once the validity of the opportunities is demonstrated, the chapter evaluates the circumstances selected for the analysis. Circumstances are conditions, situations, or factors that children were born into and that unfairly affect children's access to opportunities. 7 circumstances are selected in this study by reviewing the related literature, and by examining the potential circumstances that can be derived from the available data. These circumstances can be classified under three broad categories: demographic (2), socio-economic (3) and geographic (2).

7. RESULTS

This chapter presents the results of the study using the HOI methodology and discusses the results[87]. The results will be demonstrated for each opportunity for each broad category of opportunities (i.e., infrastructure, education, and health and nutrition). Four kinds of analysis will be provided for each opportunity.

i. The presentation of the coverage, Dissimilarity index, HOI and penalty of the opportunity,
ii. Elaboration of the annual rate of change in HOI and coverage,
iii. Identification and discussion of the contribution of each circumstance and circumstance groups to the total IOP (decomposition over circumstances results), and
iv. Identification of the dynamics behind the change in HOI from one year to another (results for decomposition over time)

The first and third types of analysis will be made for six time points (1993, 1998, 2003, 2008, 2013, and 2018) when the TDHS was conducted and the changes in these dynamics over time will be elaborated. The second and fourth analyses will provide five results, one for every two consecutive time points (1993 to 1998, 1998 to 2003, 2003 to 2008, 2008 to 2013, and 2013 to 2018).

7.1 Basic Infrastructure

7.1.1 Access to Water[88]

The results for access to clean water are presented in Figure 7-1. The access has been almost universal since 1993 with the coverage rate fluctuating around 95 percent. The D-Index is also very low, 1-2 percent, implying that most of the access is distributed fairly among circumstance groups. For example, in 1998, the coverage rate of clean water was 93 percent and 91 percentage points (pp) of the access was

[87] Year by year results are presented in Appendix C.: Analysis Results
[88] As discussed in Chapter 6.1.1.1, For year 1993, the definition of access to water relies on the type of drinking water source only. Therefore, this year will not be analyzed in this section and the analysis results are given for indicative purposes.

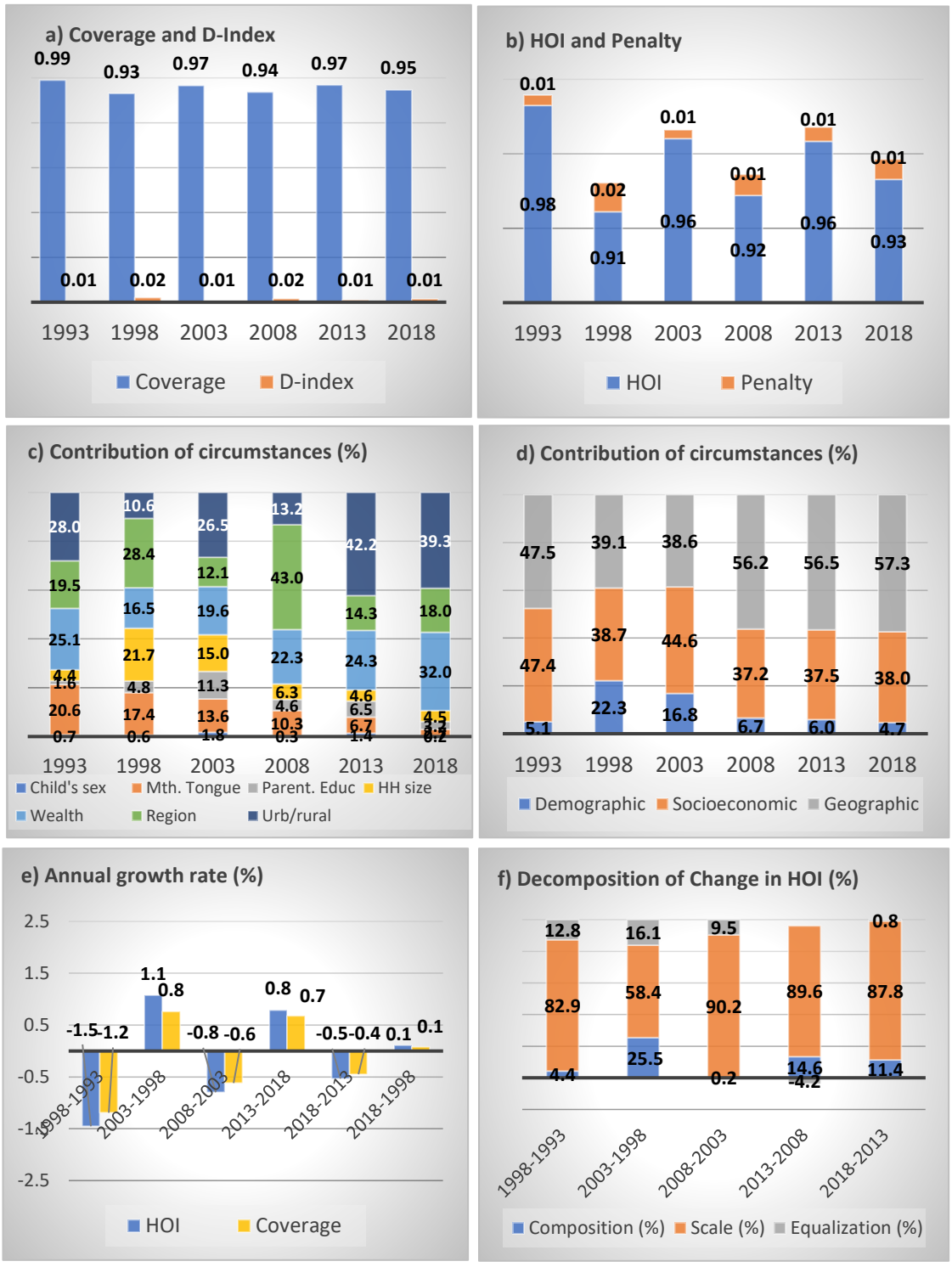
distributed in line with the EOP principle. In other words, only 2 percent of access (2 pp of 93) needs to be reallocated to ensure the prevalence of inequality.

In line with the small D-Index value, the penalty was low in the 1998-2018 period, around 1-2 percent, implying a fair distribution of the opportunity across circumstance groups. Consequently, the HOI was high ranging from 91 percent to 96 percent. Since the access to water was high and steady for the whole period, the annual rate of change in coverage and HOI was negligible, only 1 percent between 1998-2018. The highest growth rate was for the 1998-2003 period with 1.1 and 0.8 percent annual growth in HOI and coverage respectively.

As for the contributors to the inequality (Panel c and d in Figure 7-1), region, type of place of residence and wealth were the circumstances that contributed to inequality the most for the whole period. These three circumstances account for between 55 and 89 percent of the inequality for each period. Interestingly, mother tongue and household size contributed significantly to the inequality in 1998 and 2003 but this contribution decreased thereafter. The sex of the child along with the parental education had little effect on inequality. As a consequence of the explained dynamics, the geographical circumstances were the leading contributors to inequality closely followed by socio-economic ones. These two broad groups accounted for between 77 and 94 percent of the D-Index. Demographic circumstances were a factor in 1998 and 2003 but not after this year.

Panel f in Figure 7-1 shows the dynamics behind the change in HOI over time. The changes in HOI were limited between periods, and this change was mainly due to the scale effect implying that the access of each circumstance group changed proportionally. The composition effect also contributed to changes between 1998 and 2003, and 2008-2013 implying that the HOI changed due to the movements of children between circumstances. The equalization effect, which indicates changes in line with the EOP principle, has limited impact on changes over time except for the 1998-2003 and 2003-2008 periods. The equalization effect was even negative in the 2008-2013 period.

Figure 7-1. The coverage rate, D-Index, HOI, penalty and decomposition results for access to water (age group 0-17)



Source: Own calculations

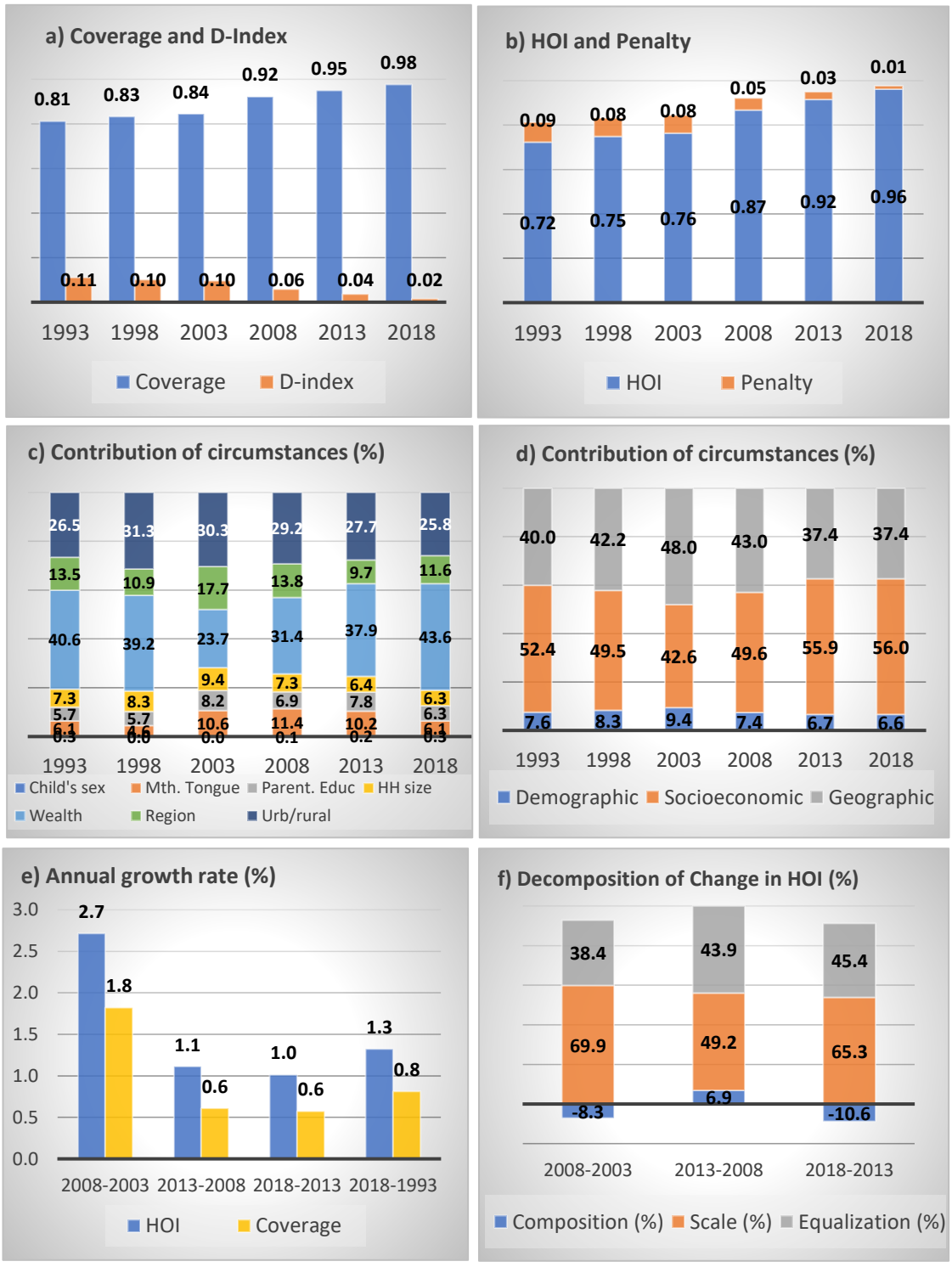
7.1.2 Access to Sanitation[89]

The results for access to sanitation are presented in Figure 7-2. The coverage rate improved steadily from 1993 to 2018. The share of children with access to improved sanitation was only 81 percent in 1993 and this share increased by 3 percentage points from 1993 to 2003 to 84 percent. The improvement was much faster after this year and it reached 92, 95 and 98 percent in 2008, 2013 and 2018 respectively. Hence, the access has been almost universal since 2013. Meanwhile, the D-Index followed a decreasing trend. In 1993 the D-Index was 11 percent, and it reduced continuously during the period and reached 2 percent in 2018. This indicates that 11 percent of the available opportunity was distributed unfairly in 1993 and this share was reduced to 2 percent in 2018. The fact that the coverage improved while the D-Index was decreasing indicates that the access increased in a fair way. This trend is also visible in HOI and penalty figures (Panel b). The HOI has risen uninterruptedly in the period. It was only 72 percent in 1993 indicating that only 72 percentage points of available opportunities were distributed in line with the EOP principle. In the same year, the penalty was 9 percent suggesting that 9 percentage points of all available access (81 percent) was distributed unfairly among circumstances and the EOP principle requires reallocation of this 9 percent. The HOI increased to 76, 87, 92 and 96 percent in 2003, 2008,2013 and 2018 respectively and the penalty decreased from 8 percent to 1 percent in the same period.

The annual rate of change in HOI and coverage rate is given in Panel e. Accordingly, the annual growth rate between 1993 and 2018 is 1.3 and 0.8 percent in HOI and coverage. This rate was highest in the 2003-2008 period with 2.7 and 1.8 percent annual rates of growth in HOI and coverage respectively. The growth rate was much lower in the 2008-2013 and 2013-2018 period, around 1 percent for HOI and 0.6 percent for coverage.

[89] As discussed in Chapter 6.1.1.1, for year 1998, the definition of access to sanitation relies only on the type of facility since the data for shared or unshared use of toilet facility was not available in TDHS 1998. Therefore, the results for 1998 will not be elaborated in this section and the results are given for indicative purposes.

Figure 7-2. The coverage rate, D-Index, HOI, penalty and decomposition results for access to sanitation (age group 0-17)



Source: Own calculations

Panel c and d in Figure 7-2 present the contribution of individual and grouped circumstances to inequality (D-Index). Wealth and type of place of residence were the circumstances that contributed to inequality the most. The differential access of different wealth groups contributed to around two-fifths of the inequality in 1993, 2013 and 2018. The type of place of residence is responsible for between 26 and 31 percent of the inequality in all years. Not surprisingly, the sex of the child's contribution to inequality was almost non-existent.

Finally, Panel f in Figure 7-2 demonstrates the decomposition result over time. Accordingly, the improvement in HOI over time was mainly due to the scale effect and equalization effect. The contribution of the composition effect was low or even negative for the 2003-2008 and 2013-2018 periods.

7.1.3 Access to Computer

The results for access to computer are presented in Figure 7-3. The coverage rate of computer among children was only 2 percent in 1993. Access to computer increased to 4 percent in 1998 and 11 percent in 2003. During this period, the absolute increase in coverage rate remained comparatively low (from 2 to 11 percent) although the proportionate increase was high (more than fivefold). In the next ten years (from 2003 to 2013) both absolute and proportionate increases were noteworthy, the coverage rising to 39 percent in 2008 and 55 percent in 2013. Surprisingly, the coverage rate decreased by 14 percentage points to 41 percent in 2018. However, this decrease is suspicious considering the increase in the use of information and communication technologies at the national and global levels. It is also not consistent with the findings of the Survey on Information and Communication Technology (ICT) Usage in Households of Turkstat which found that the computer usage rate was 59.6 percent among individuals aged 16-74 (Turkstat, 2018)[90]. Therefore, the results for 2018 should be interpreted with caution.

[90] The result of the 2013 survey is similar to results derived from TDHS 2013 although the age groups are different (55 percent in TDHS 2013 vs 50 percent in Turkstat).

The D-Index was 78, 68 and 65 percent in 1993, 1998 and 2003 respectively indicating a very high level of inequality. The D-Index decreased to 43 percent in 2008 and then around to 30 percent in 2013 and 2018. Interpreting the D-Index together with the coverage rate shows that the limited number of opportunities was distributed very unfairly among circumstances in these years. This pattern can also be seen in HOI. It was very low in 1993, 1998 and 2003 (less than 1, 1 and 4 percent respectively). After 2003, it increased more than 5-fold to 22 percent in 2008 and to 39 percent in 2013. The penalty has also followed an upward trend, increasing from 1 percent in 1993 to 17 percent in 2008 and slightly decreasing to around 15 percent thereafter.

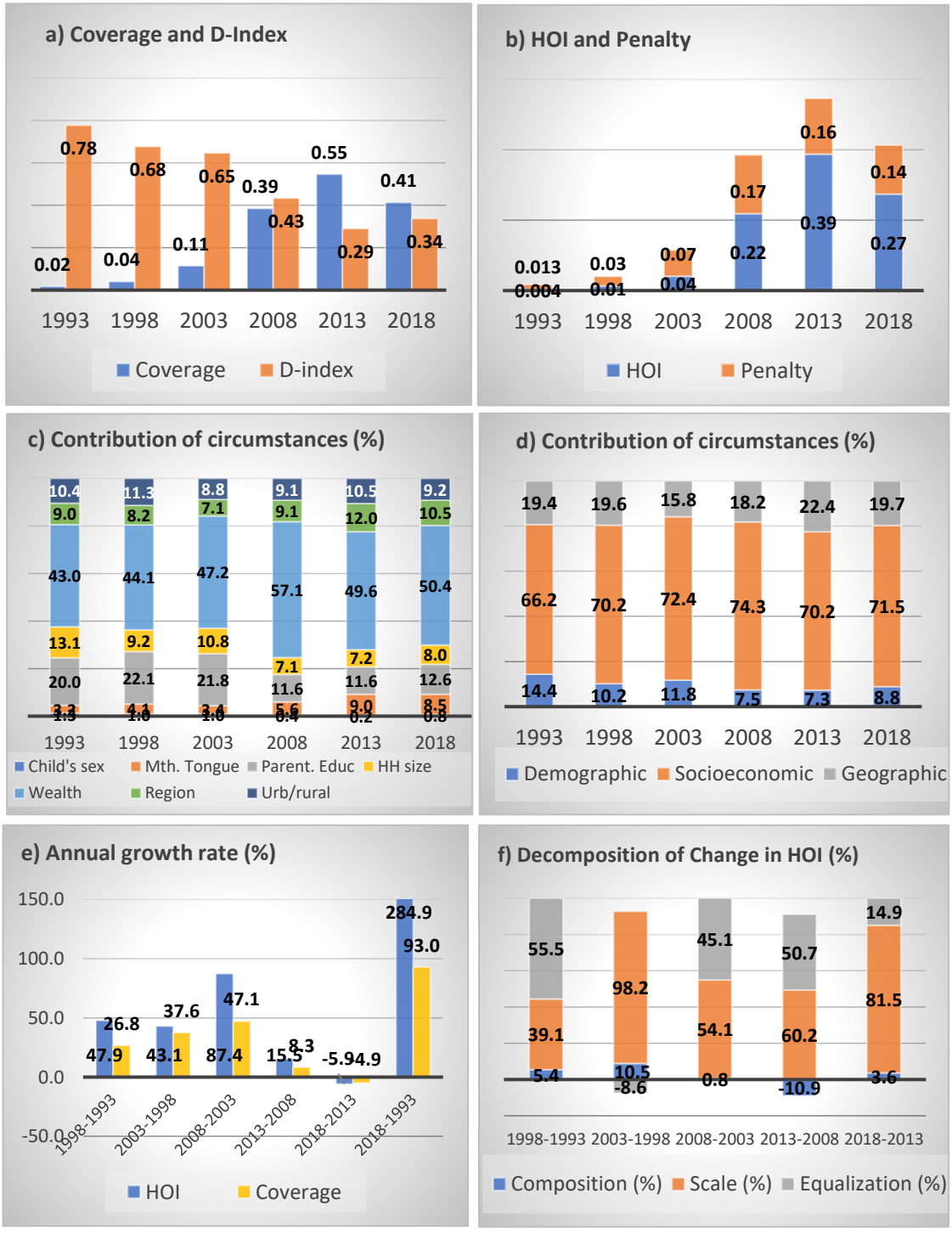
The annual growth rate in HOI and coverage rate is high for all periods. From 1993 to 2018, the annual rate of increase was 285 and 93 percent for HOI and coverage respectively. The highest growth rate among 5-year periods belongs 2003-2008 period. Naturally, the rate of increase was higher in the first periods compared to the last period (2008-2018) due to very low access at the beginning.

Panels c and d of Figure 7-3 demonstrate how much each circumstance and circumstance group contributes to inequality. For all periods, wealth is the main contributor to inequality which fluctuates around 50 percent in the 1993-2018 period. This signals that the differential access to computer among children from different wealth groups is a major factor in the total inequality. Parental education is the second most important circumstance contributing around 20 percent in 1993, 1998 and 2003 and around 12 percent in 2008,2013 and 2018 to D-Index. Region and type of place of residence were also somewhat important, contributing around 8 to 12 percent each. Similar to the previous two opportunities, the sex of the child is found to have an insignificant effect. As for broad circumstance groups, the socioeconomic group which includes wealth and parental education found to be the most important circumstance group accounting for around 70 percent of the inequality followed by the geographic group (around 20 percent) for the whole duration.

Panel f of Figure 7-3 shows which factor played a significant role in the change of HOI over time. Accordingly, the steady increase in HOI stemmed from the scale and equalization effects except for 1998 to 2003 in which the equalization effect was

negative and the scale effect dominated the change in HOI. Over the whole period, the composition has a low contribution to changes in HOI.

Figure 7-3. The coverage rate, D-Index, HOI, penalty and decomposition results for access to computer (age group 6-17)



Source: Own calculations

7.1.4 Access to Internet

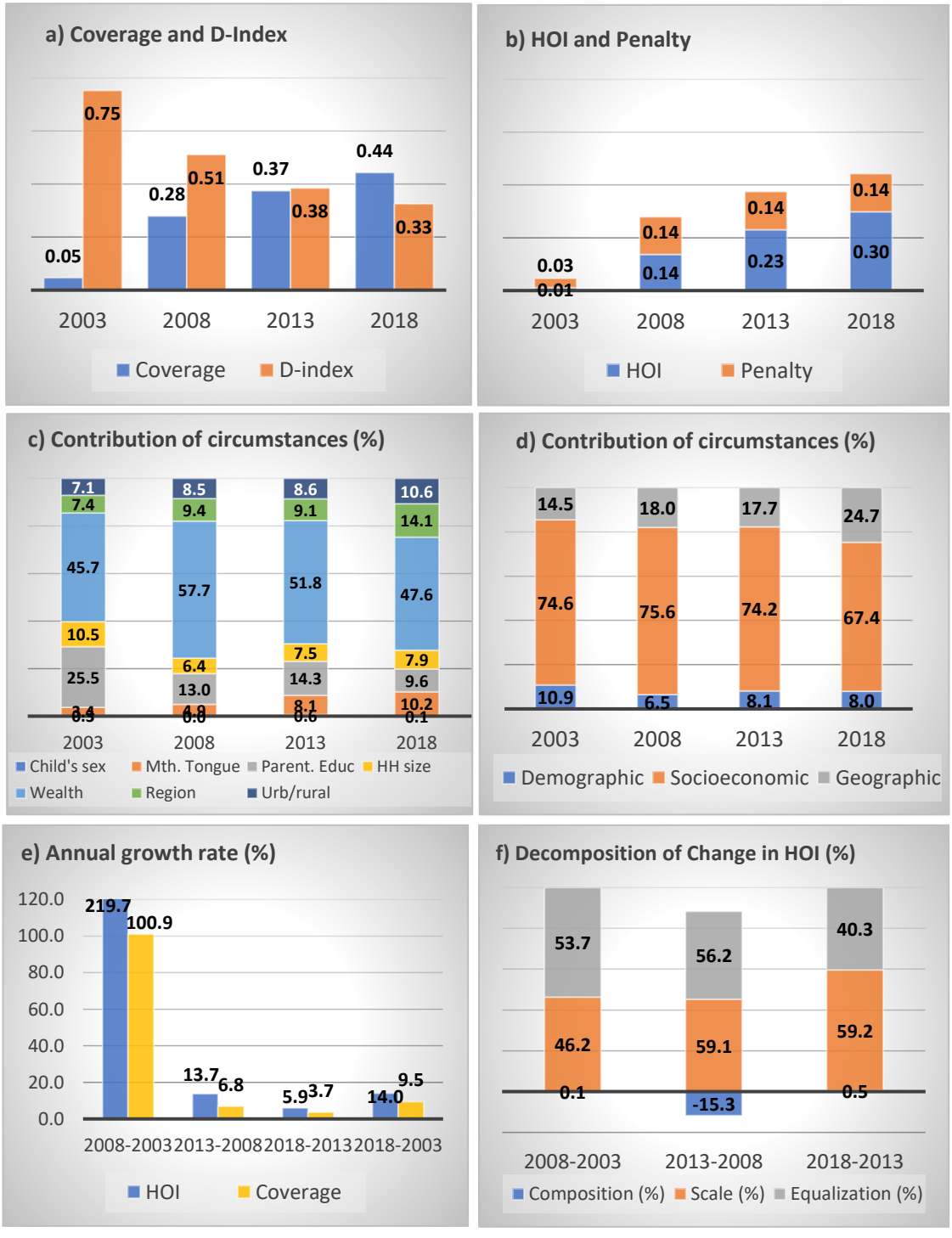
The results for internet access are presented in Figure 7-4. As previously discussed, the data for internet access is available from 2003 onwards. In 2023, the access to internet among children was only 5 percent and 75 percent of this access was not distributed in line with the EOP principle (D-Index). Hence, the HOI was slightly higher than 1 percent and the penalty was around 3 percent in the same year. The access increased to 28 percent and the D-Index decreased to 51 percent in 2008 leading to a HOI and penalty of 14 percent. These figures suggest that half of the opportunities were distributed in line with the EOP principle and half were not in 2008. In 2013 and 2018, the coverage rate rose to 37 and 44 percent respectively while the D-Index reduced to 38 and 33 percent. As a result of these, the HOI reached 23 and 30 percent in the same years while the penalty remained constant at 14 percent.

The annual rate of change in HOI and coverage rate was 14 and 9.5 percent respectively for the 15 years between 2003 and 2018. The fastest increase was from 2003 to 2008 with an annual growth rate of 220 and 101 percent for HOI and coverage. Surprisingly, the second highest growth rate was for the 2013-2018 period which is 14 percent for HOI and 9 percent for coverage. This is surprising because the growth rate decreases over time due to the increase in the base year's value for most cases.

Panels c and d of Figure 7-4 present the contribution of each circumstance and circumstance group to D-Index. Similar to computer access, the majority of inequality in access to internet stemmed from two circumstances, namely wealth and parental education. Region and type of place of residence also contribute around 10 percent to the inequality. Interestingly, the contribution of the mother tongue became more pronounced over time, reaching to 10 percent in 2018. Moreover, the contribution of sex of the child was negligible for the whole period. As for the circumstance groups, socioeconomic circumstances were the main source of differences in access to internet (between 67 and 76 percent), followed by geographic circumstances (between 15 and 25 percent). However, the results in Panel d indicate that the contribution of socioeconomic circumstances has decreased over time while the contribution of

geographic factors increased probably due to the decrease in the price of internet connection.

Figure 7-4. The coverage rate, D-Index, HOI, penalty and decomposition results for access to internet (age group 6-17)



Source: Own calculations

Panel f of Figure 7 4 demonstrates the decomposition results of the change in HOI over time. Similar to the case of computer access, the scale and equalization effects are the source of change in HOI over time. From 2003 to 2008, the equalization component was slightly more pronounced, but for other periods the contribution of the scale component was higher although not by much. The composition component was negligible for the first and last periods, and it had a negative contribution in the second period (2008-2013).

7.1.5 Access to Birth Registration

The results for access to birth registration are presented in Figure 7-5. The coverage rate of this opportunity was 72 percent among children under the age of 5 and the D-Index was 11 percent in 1993. This indicates that 89 percent (100 minus D-Index) of the available access (72 percent access) was distributed according to the EOP principle. The coverage rate increased steadily over time and reached 77 percent in 1998, 85 percent in 2003, 96 percent in 2008, 99 percent in 2013 and 98 percent in 2018. Hence, it became almost universal from 2008 onwards. Consequently, the D-Index decreased substantially to 9, 5, and 2 percent in 1998, 2003, and 2008 respectively, and became negligible after that.

The HOI and the penalty followed a similar pattern to the coverage rate and the D-index respectively. The HOI was 64 percent in 1993 suggesting that 64 percentage points of the total opportunities were distributed fairly among all circumstance groups. The HOI increased consistently and reached 99 percent in 2013 and decreased slightly to 97 percent. The penalty was 8 percent in 1993 implying that 8 percentage points of available opportunities (i.e., coverage rate) were distributed unfairly. The penalty reduced significantly as the coverage rate and HOI increased and became almost negligible in 2008 and onwards.

These trends in the indices show that access to birth certificates was somewhat low in the 1990s and there exists some level of inequality. However, the access increased, and the inequality decreased significantly in the 2000's. The annual growth rate (see Figure 7-5.e) was 1.5 percent for the coverage rate in the 1993-2018 period. The same rate was 2.1 percent for HOI. This difference in the annual growth rate of

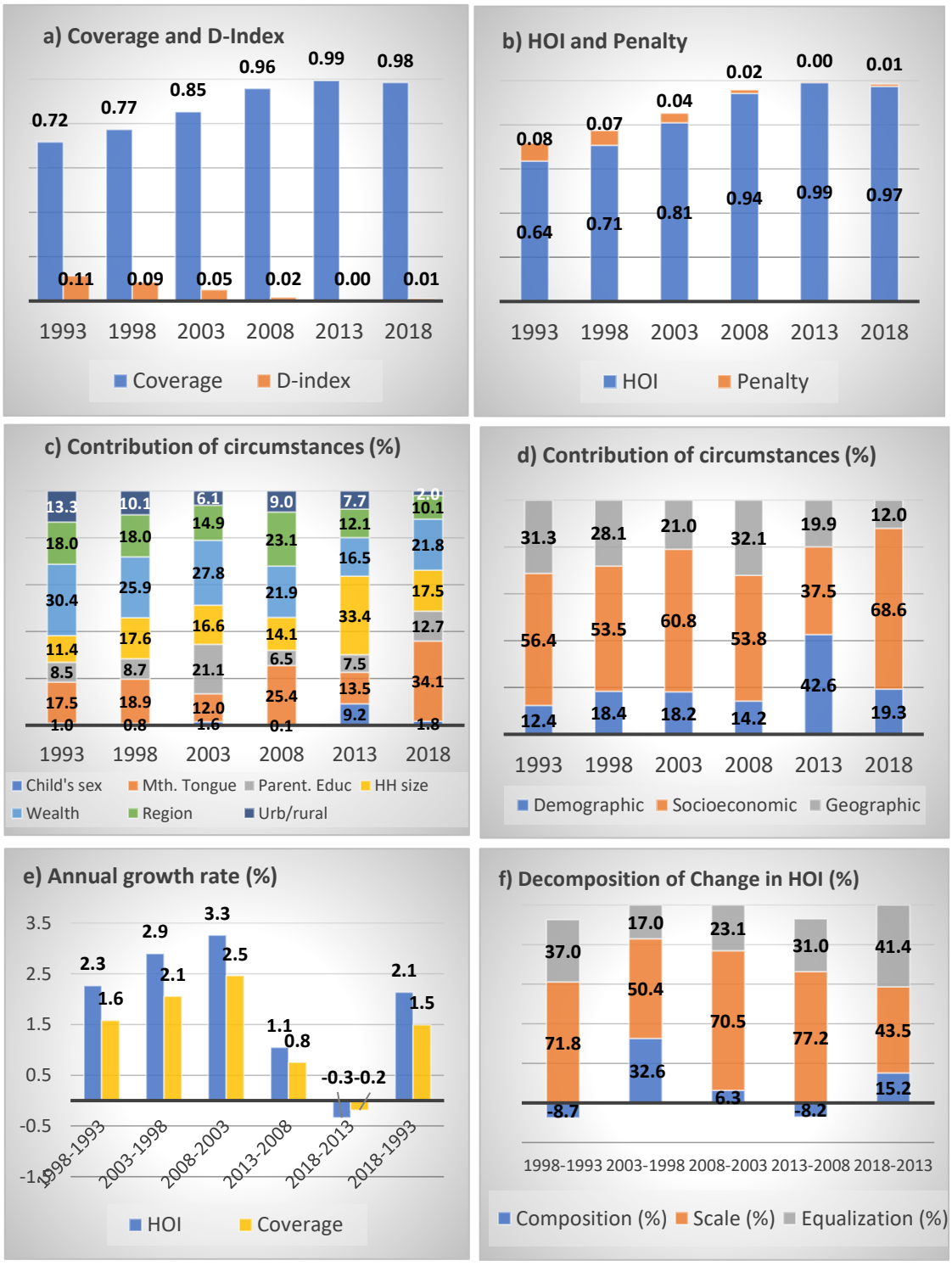
HOI and coverage rate (i.e. the rate of change in HOI being greater than coverage) suggests that the access increased in a way that enhances EOP. The period 1993-1998, 1998-2003 and 2003-2008 experienced above average growth rates for both the coverage and HOI and the growth rate for both indices was highest for the 2003-2008 period (2.5 and 3.3 percent respectively). The growth rate decreased after 2008 since the access became almost universal in 2008.

Panel c and d in Figure 7-5 show the contribution of circumstances to IOP. Wealth, mother tongue, region and household size were the main contributors to inequality. In 1993, 1998 and 2003, around a quarter or more of the total inequality was due to differences in access between different wealth groups. In the same period, region and mother tongue together were responsible for between one-fourth and one-third of the inequality. Surprisingly, the sex of the child's contribution to the total inequality was negligible ranging between 0.1 and 2 percent[91]. Looking at the contributors to inequality in broad categories reveals that between half and two-thirds of the total inequality source from the circumstances categorized under the socio-economic category for the whole duration. The contribution of geographic circumstances was more pronounced in the 1993-2008 period ranging between 21 and 32 percent, but they remained behind the demographic circumstances in 2013 and 2018. Although access to birth registration is almost universal in 2018, policymakers should look at the differences between groups with different mother tongues, wealth, and household sizes and establish the targeting mechanisms and policy interventions accordingly to ensure full access to registration.

Finally, Panel f in Figure 7-5 demonstrates the dynamics behind the change in HOI between periods. The scale effect was the leading factor in the changes in HOI followed by the equalization effect. The effect of the composition was limited (even negative in 1993-1998 and 2008-2013 periods) in the 25 years except for the 1998-2003 period.

[91] Although it was 9.2 percent in 2013, it is negligable since the inequality was almost nonexistent in this year.

Figure 7-5.The coverage rate, D-Index, HOI, penalty and decomposition results for birth registration (age group 0-4)



Source: Own calculations.

7.2 Education

This chapter looks at the IOP dynamics in four educational opportunities, namely starting primary education on time, access to primary education and secondary education, and completing primary education on time.

7.2.1 Starting Primary Education on Time

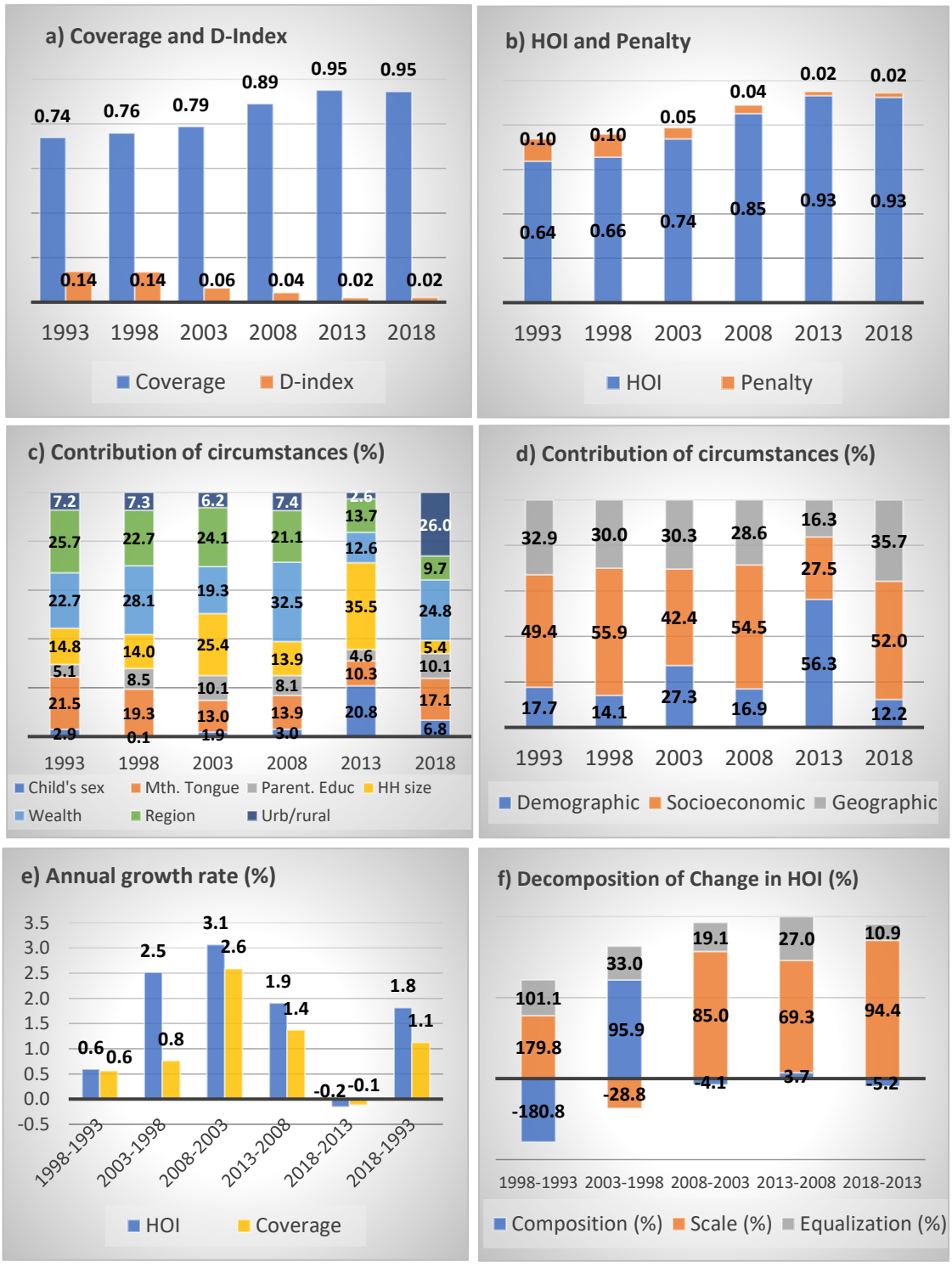
The results for starting primary education on time are presented in Figure 7-6. The access and HOI followed an upward trend during the 25 years while the inequality decreased over time. In 1993, the coverage rate was 74 percent and 86 percent (100 minus D-Index) of this access was distributed in line with the EOP principle. Hence, 64 percentage points of the available opportunity (HOI) was fair in terms of its distribution among circumstances and the remaining 10 percent (Penalty) was unfair implying that certain groups have higher access rates. All indicators had similar levels in 1998 compared to 1993 except for a 2-percentage point increase in coverage and HOI. In 2003, the coverage rate reached 79 percent while the D-Index decreased significantly to 6 percent (from 14 percent in 1998). As a result of these changes, the HOI and penalty were 74 and 5 percent respectively. From 2003 to 2008, the increase in access and the decrease in inequality continued and the coverage, HOI, D-Index and penalty reached 89, 85, 4 and 4 percent respectively. From 2008 to 2013, there was a further increase in access and HOI and a further decrease in inequality. Consequently, of the 95 percent access (coverage) in 2013, only 2 percent (D-Index) was unfairly distributed leading to a HOI of 93 percent. The figures remained the same in 2018.

The annual rate of increase in coverage and HOI was 1.8 and 1.1 percent from 1993 to 2018 (see Panel e). The fact that the growth rate of HOI is higher than coverage signals an opportunity equalizing growth for the starting primary on time. The annual growth was higher than the 25-year average for the 2003-1998, 2008-2003 and 2013-2008 periods. The highest growth rate was experienced in the 2008-2003 period with an annual increase of 3.1 percent in HOI and 2.6 percent in coverage. The rate of growth was almost zero from 2013 to 2018 indicating a saturation around 95 percent of access and 93 percent of HOI.

Panels c and d in Figure 7-6 presents how much each circumstance and circumstance group contributes to D-Index. Although there are some variations over time, wealth, region and household size were the main sources of inequality. These three circumstances and mother tongue account for more than 80 percent of inequality in 1993, 1998, 2003 and 2008. However, this trend changed slightly in 2013 and 2018. In 2013, the sex was the second highest contributor (21 percent) to inequality. In addition, 2013 was the only year when the sex of the child was a significant source of inequality. Its contribution was less than 3 percent in 1993, 1998, 2003 and 2008, and 7 percent in 2018. Comparatively high contribution of sex in the recent period signals that gender started to play some role in the small inequality that was prevalent from 2013 onwards. Similar to sex, the type of place of residence was not a major contributor to inequality until very recently. Its contribution was only around 3-7 percent between 1993 and 2013, but this increased to 26 percent in 2018. The contribution of parental education remained low during the whole period. As for the circumstance groups, socioeconomic factors were the major source of inequality contributing to around 50 percent of D-Index except for 2013. The geographic circumstances' contribution fluctuated around 30 percent except in 2013. The effect of demographic circumstances was highest in 2013 (56 percent) which is one year after the extension of mandatory education to 12 years and the start of the controversial 4+4+4 system.

Panel f in Figure 7-6 demonstrates the causes of the change of HOI between periods. From 1993 to 1998, the increase in HOI (2 pp) came from the scale and equalization effect. The composition effect had a very large and negative effect. Interestingly, the dynamic from 1998 to 2003 was quite the opposite. The composition effect was the main source of the increase in HOI (3 pp) and the scale effect contributed negatively to the change. From 2003 onwards, the scale effect dominated the changes in HOI. This indicates that the jump in access from 2003 to 2013 stemmed from the scale effect with some contribution from equalization.

Figure 7-6. The coverage rate, D-Index, HOI, penalty and decomposition results for starting primary education on time (age group 6-7)



Source: Own calculations

7.2.2 Primary Education Attendance

The results for access to primary education are presented in Figure 7-7. The access and HOI increased consistently from 1993 to 2008 and remained steady thereafter. Meanwhile, the indicators of inequality (D-Index and penalty), which were not high even at the beginning of the period, decreased and became negligible. In 1993, the access to primary education was 81 percent among children aged 6 to 13 and 93 percent of this access was distributed in line with the EOP principle. In other words, 75 percentage points (HOI) of the available 81 percent access was distributed fairly and the remaining 6 percentage points (penalty) was distributed unfairly among circumstances. These figures remained almost the same in 1998 with a minor increase in inequality. However, the period from 1998 to 2003 saw a large increase in access (10 percent) and HOI (15 percent). In the same period, both D-Index and penalty decreased significantly which is the main reason why HOI increased more than the coverage. From 2008 onwards, the access became almost universal, and the inequality became negligible. In 2018, both coverage and HOI were 97 percent, and the D-Index was 1 percent which is why the coverage and HOI were almost the same.

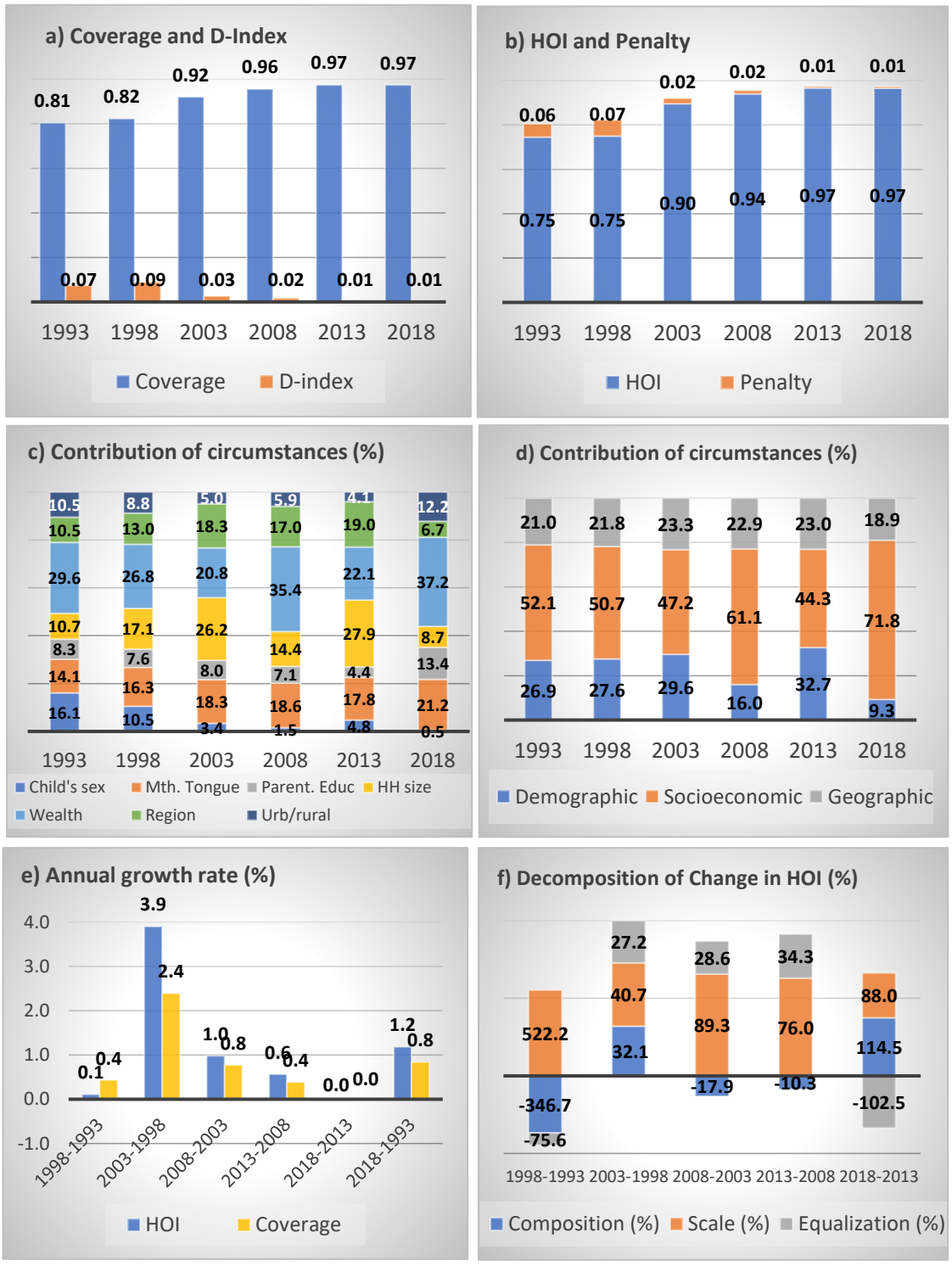
Panel e in Figure 7-7 presents the annual growth rate for the period of interest. The annual rate of increase from 1993 to 1998 is 0.8 and 1.2 percent for coverage and HOI. The higher annual growth rate for HOI compared to coverage demonstrates an opportunity equalizer growth trend. The highest growth rate was for the 1998-2003 period (3.9 and 2.4 percent for HOI and coverage respectively), followed by the 2003-2008 period (1 and 0.8 percent). For the remaining periods, the annual rate of increase was comparatively low (0.6 percent or less).

Panel c and d in Figure 7-7 show the contribution of circumstances to inequality. Unlike the previous opportunities, it is not possible to highlight a major contribution from a few circumstances except for wealth. Wealth's contribution to the D-Index was 30, 27, 21 and 35 percent in 1993, 1998, 2003 and 2008 respectively. These shares made wealth the highest contributor to inequality in 1993,1995 and 2008 and the second highest in 2003. The sex of the child was an important contributor to inequality in 1993 and 1998 (16 and 11 percent respectively) and its contribution

became insignificant afterward which were the years with very low inequality. Mother tongue was also a major source of inequality in all years whose contribution ranged between 14 and 21 percent. Household size together with the region were other important factors, especially in 2003 and 2013. The contribution of parental education was comparatively low but still important, around 8 percent between 1993 and 2008, and 13 percent in 2018. Like parental education, the type of place of residence was also a factor in equality although it was relatively less important. As for circumstance groups, socioeconomic circumstances were the major driver of inequality contributing 44 percent or more to D-Index for all 6 periods. The contribution of demographic and geographic circumstances was also significant for the whole period. The contribution of demographic circumstances was higher in 1993, 1998, 2003 and 2013 and geographic circumstances were more important in 2008 and 2018.

Panel f in Figure 7-7 includes the decomposition of HOI between periods. Since HOI did not change significantly from 1993 to 1998 and from 2013 to 2018, the analysis for these periods would not give a meaningful interpretation. For the remaining periods, the scale effect was the main factor in changes in HOI values. It was responsible for 41 percent of change in HOI from 1998 to 2003 when the change in HOI was the highest. In the same period, the composition effect and equalization effect also played a significant role (32 and 27 percent respectively). For the other two periods, i.e., 2008-2003 and 2013-2008, most of the increase in HOI came from the scale effect (89 and 76 percent). In the same period, equalization was also in place explaining around 30 percent of the increase in HOI. Interestingly, the composition effect was negative in these periods.

Figure 7-7. The coverage rate, D-Index, HOI, penalty and decomposition results for access to primary education (age group 6-13)



Source: Own calculations

7.2.3 Completion of Primary Education on Time

The results for completing primary education are given in Figure 7-8. The coverage rate and HOI followed an upward trend from 1993 to 2018. Meanwhile, the inequality diminished significantly. In 1993, the share of children who completed primary education on time was only 39 percent and 26 percent of this access was distributed unfairly among circumstances. These levels of access and penalty led to an HOI and penalty of 29 and 10 percent significantly. These indicators signal that the access was quite low and inequal in 1993. In 1998, the access increased slightly to 44 percent while the level of inequality remained the same. As a result, the HOI was 33 percent and the penalty was 11 percent implying that of the available access (44 percent), 33 percentage points were distributed fairly, and the remaining 11 percentage points were distributed unfairly to some circumstance groups. From 1998 to 2003, the completion rate experienced a major increase to 66 percent with the influence of the extension of mandatory education from 5 to 8 years in 1997. This upward jump in access was accompanied by a large fall in inequality (D-Index value of 12 percent) which suggests that the OVG benefitted from the extension of mandatory education duration. Consequently, the HOI increased by 25 percentage points to 58 percent and the penalty decreased to 8 percent. The upward trend continued, and the coverage rate and HOI reached 80 and 75 percent respectively in 2008. The indicators of inequality further decrease to around 6-7 percent. Although the second extension of mandatory education (from 8 to 12 years) came into force in 2012, its impact on the completion of primary education was not visible in 2013 due to the natural lag between starting secondary education and completing it. Nevertheless, the coverage rate rose to 86 percent with and a lower inequality (6 percent D-Index). In the same year, the HOI and penalty were 81 and 5 percent respectively. In 2018, the extension of mandatory education stepped in, and coverage and HOI reached 99 and 98 percent respectively indicating universal access.

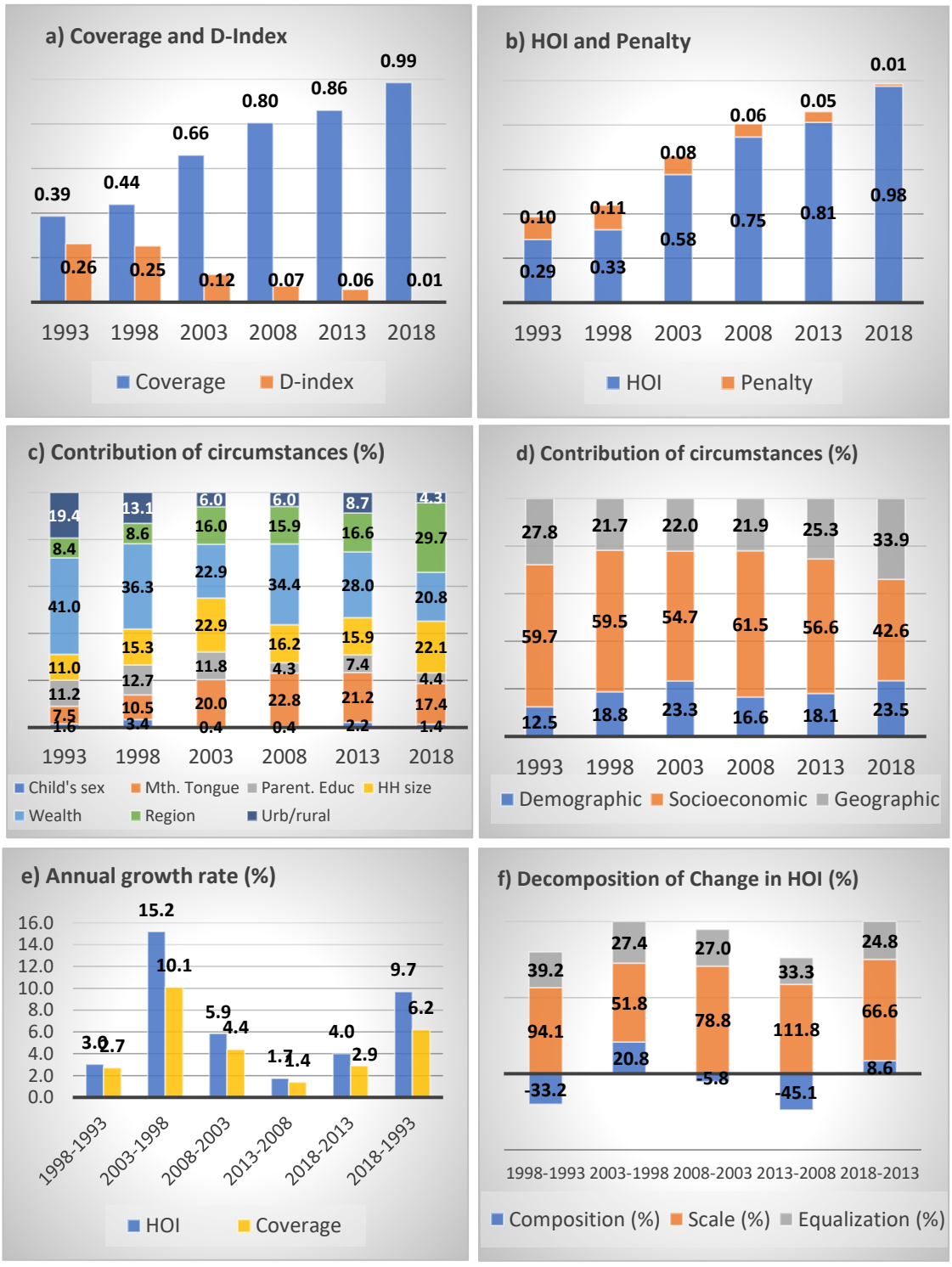
The trend in coverage and HOI explained in the previous paragraphs also reveals itself in the annual growth rates (Panel e of Figure 7-8). The rate of increase was very high, 10 and 6 percent for HOI and coverage respectively, from 1993 to 2018. The higher growth rate of HOI compared to coverage suggests an opportunity

equalizing growth for the whole duration. The growth rate was highest (15 and 10 percent for HOI and coverage respectively) in the 2003-1998 period due to the first extension of the mandatory education period. The second period of extension (2013-2018) when the mandatory education duration was further extended to 12 years experienced a much lower annual growth rate, namely 4 and 3 percent for HOI and coverage, due to the high level of completion in the base year.

Panels c and d of Figure 7-8 discuss the contribution of circumstances to inequality. Wealth was the most important circumstance for all periods except 2018. In 1993 and 1998 differential access among wealth groups accounted for around two-fifths of the D-Index. In the same periods, the type of place of residence, household size, and parental education were also important contributors to inequality. They contributed 40 percent to D-Index in 1993 and 1998. In 2003, 2008 and 2013, wealth, mother tongue, household size, and region contributed significantly to D-Index. Since the D-Index was negligible in 2018, the contribution of each circumstance to it is not interpreted here. As for the circumstance groups, the socioeconomic circumstances were the major source of inequality although the contribution of geographic and demographic circumstances were significant.

Panel f in Figure 7-8 shows the decomposition of HOI between periods. The scale effect played a major role in the increases in HOI followed by the equalization effect. The contribution scale effect to changes in HOI ranged between 52 and 112 percent in the whole period. The equalization effect explained between a quarter and two-fifths of the increase in HOI. The composition effect on the other hand contributed negatively to the changes in HOI (from 1993 to 1998, from 2003 to 2008, and from 2008 to 2013) but this negative effect was surpassed by the scale and equalization effects and the net result was an increase in HOI over time.

Figure 7-8. The coverage rate, D-Index, HOI, penalty and decomposition results for completing primary education (age group 14-15)



Source: Own calculations

7.2.4 Attendance to Secondary Education

The analysis results for secondary school enrollment are given in Figure 7-9. The coverage and HOI rose significantly from 1993 to 2018 while the inequality diminished over time. Still, access did not reach a universal level and the inequality did not disappear even though mandatory education started to cover secondary education from 2012 onward. In 1993, only 37 percent of the children (of school age) were enrolled in secondary education and a quarter of this access was not distributed according to the EOP principle. Consequently, the HOI was 28 percent, and the penalty was 10 percent. In 1998, the coverage increased by 4 percentage points to 41 percent, but the D-Index remained at a similar level (11 percent) leading to a HOI of 31 percent and a penalty of 11 percent. The period from 1998 to 2003 experienced an immense jump in secondary school enrollment to 70 percent. During the same period, the D-Index reduced to 16 percent. These changes led to an HOI of 58 percent and a penalty of 11 percent. This improvement in 2003 indicates that the extension of mandatory education to 8 years in 1997 had a significant impact on secondary school enrollment and inequality even though this extension did not cover secondary education[92]. The enrollment rate reached 74 percent in 2008 and the D-Index was 12 percent in the same year. The HOI and penalty were 65 percent and 9 percent respectively indicating an improvement in access and EOP. There was another jump in enrollment in 2013 (by 11 percent compared to 2008) with the contribution of the second round of extension of mandatory education to 12 years. This extension also manifested itself in inequality and the D-Index decreased to 6 percent. Consequently, HOI increased to 80 percent. Finally, in 2018, the enrollment and HOI reached 90 and 85 percent respectively with a 5 percent inequality (both D-Index and penalty).

The annual rate of increase was 8.3 percent for HOI, which was larger than the growth rate of coverage (5.6 percent) between 1993 and 2018. Hence, there was an opportunity equalizing growth in this period. The highest growth rate was in the 2003-1998 period (18 and 14 percent). The annual growth rate was much lower for other

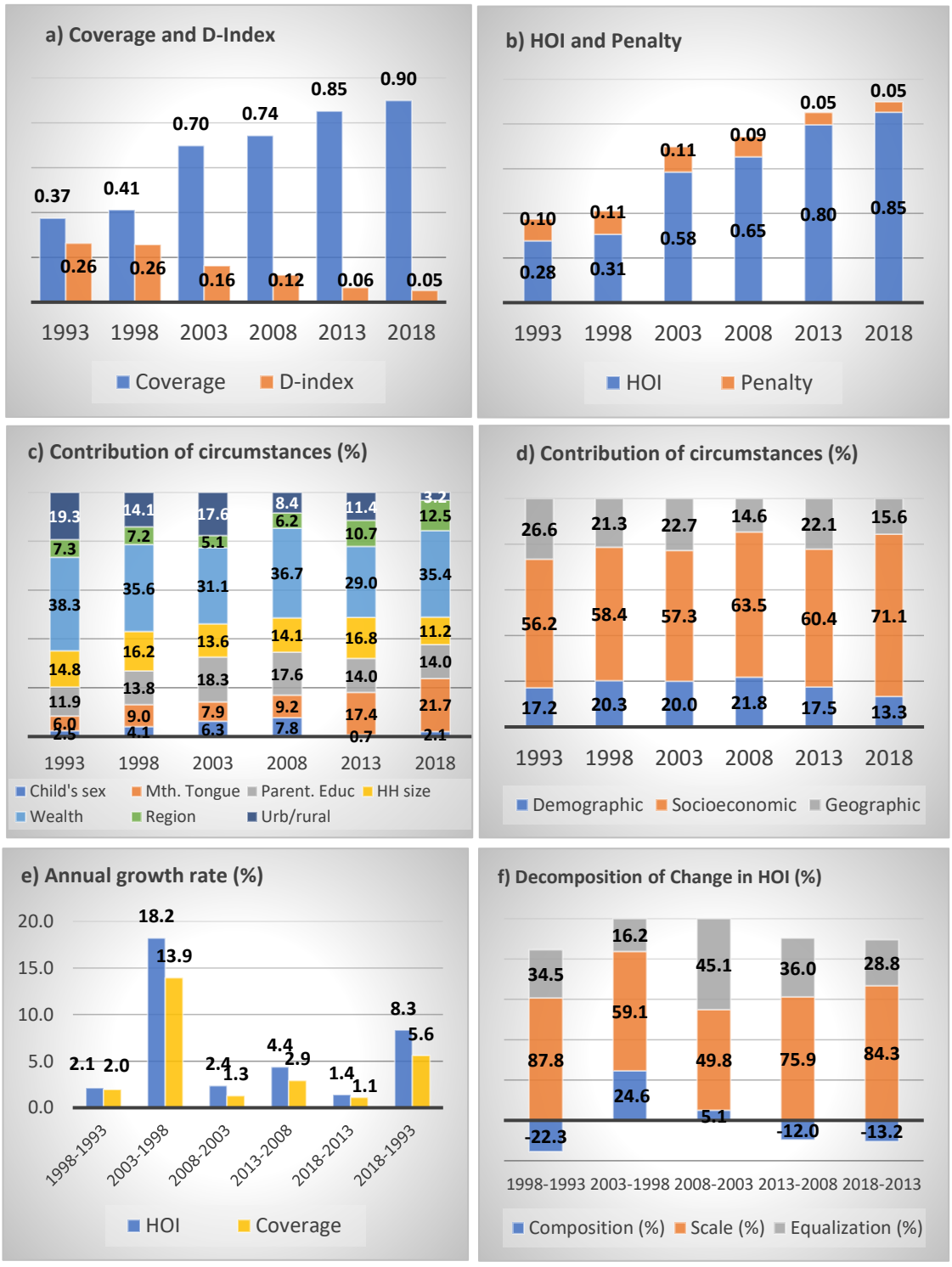
[92] The mandatory education was covering primary school and junior high school until 2012. The secondary school was included in the mandatory education only after 2012.

periods ranging between 1 and 4 percent. This slow growth after 2003 resulted in the access being not universal although secondary education became mandatory.

Panels c and d of Figure 7-9 discuss the contribution of circumstances to inequality. As in all educational opportunities, wealth was the main contributor to D-Index during the whole period. Around one-third of the inequality is rooted in the differential access among different wealth groups. The contribution of parental education and household size was also significant and close to each other throughout the period. The contribution of type of place of residence and mother tongue played an important role in inequality only in some years. The contribution of the type of place was more prominent in the early years whereas the contribution of mother's tongue became significant after 2013. The sex of the child was not a major contributor to inequality during the whole period. As for the circumstance groups, once again, the socioeconomic circumstances were responsible for most of the inequality (between 56 and 71 percent) for the whole period. Interestingly, the share of socioeconomic circumstances followed an upward trend over time indicating an increasing importance of socioeconomic factors in the decreasing inequality. The geographic and demographic circumstances' contribution fluctuated between 13 and 27 percent in 25 years.

Panel f in Figure 7-9 presents the decomposition result of HOI between periods. The scale effect was the main reason for the increases in all five periods. From 1993 to 1998, both scale and equalization effects played a principal role in the increase in HOI. The contribution of the composition effect was negative in this period. From 1998 to 2003, all three effects contributed to the large increase in HOI. The contribution scale, composition and equalization effect were 59, 25 and 16 percent to the 27 percent increase in HOI from 1998 to 2003. In the 2008-2003 period, both scale and equalization effects contributed to the increase in HOI whereas the contribution of the composition effect was limited. In 2013 and 2018, the composition effect was negative, but this negative effect was suppressed by large value of scale and equalization effects and the results were an increase in HOI compared to the previous survey date.

Figure 7-9. The coverage rate, D-Index, HOI, penalty and decomposition results for access to secondary education[93]



Source: Own calculations

[93] The age group is 14-16 for 1993, 1998, 2003 and 2008 and it is 14-17 for 2013 and 2018.

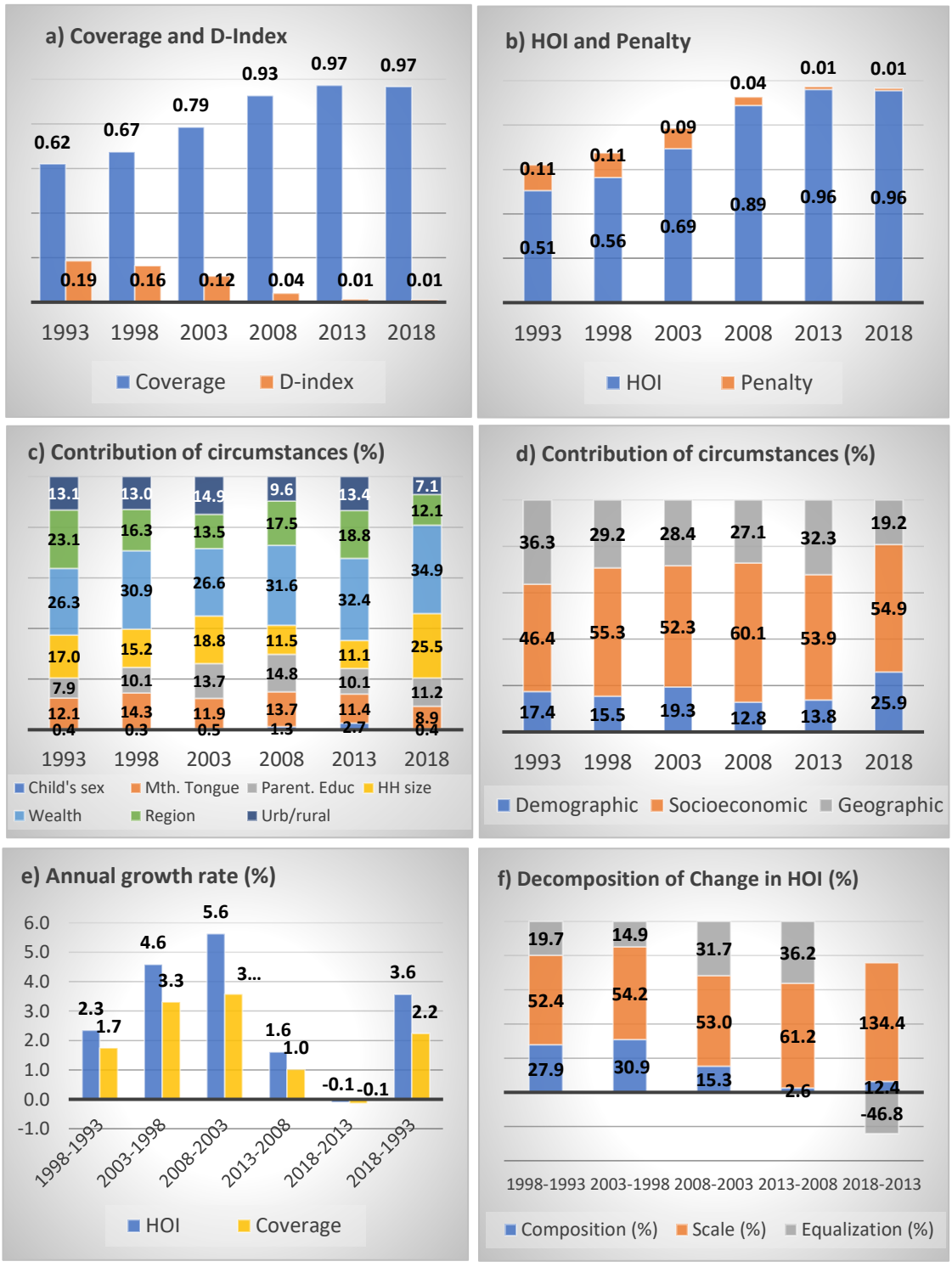
7.3 Health Services and Nutrition

7.3.1 Access to Basic Antenatal Visit

The analysis results for access to basic antenatal care are presented in Figure 7-10. The coverage and HOI rose significantly from 1993 to 2018 while the inequality diminished. Consequently, the access became universal from 2013 onwards and the inequality became negligible. In 1993, the coverage rate was 62 percent and one-fifth of this coverage (D-Index) was not distributed in line with the EOP principle. Hence, the HOI and penalty were 51 and 11 percent respectively. In 1998, both coverage and HOI increased by 5 percentage points to 67 and 56 percent respectively. In the same period, the D-Index decreased to 16 percent however the penalty remained the same. The period from 1998 to 2003 saw a large improvement in access and with some improvement in equality. The coverage and HOI reached 79 and 69 percent respectively. There was another and larger jump in access in the period between 2003 and 2008 with the contribution of the "Transformation of Health" program implemented by the Ministry of Health from 2003 onwards and increased public investment in health (see MoH (2003) and Ülkü (2011) for more details). Consequently, the access and HOI reached 93 and 89 percent respectively and the D-Index and penalty decreased to 4 percent. The improvement continued and access to basic antenatal care became almost universal (97 percent) and the inequality (D-Index 1 percent) became negligible from 2013 onwards.

The annual rate of change was 3.6 and 2.2 percent for coverage and HOI respectively from 1993 to 2018. The higher rate of increase in HOI compared to coverage demonstrates an opportunity equalizing growth over the period. The highest rate of increase belongs to the 2003-2008 period (5.6 and 3.6 percent for HOI and coverage respectively), followed by the 2003-1998 period (4.6 and 3.3 percent for HOI and coverage respectively). The growth rate in the 1998-1993 period was also high around 2 percent for each. The rate of increase decreased significantly after 2008 due to access being almost universal.

Figure 7-10. The coverage rate, D-Index, HOI, penalty and decomposition results for access to basic antenatal care (age group 0-4)



Source: Own calculations

Panels c and d of Figure 7-10 discuss the contribution of circumstances to inequality. All circumstances contributed to inequality significantly over time except the sex of the child. Indeed, the insignificant contribution of sex is not surprising since the sex of the child can be identified only after the visit to a doctor or health facility[94]. For the whole period, wealth contributes most to the D-Index. Focusing especially on the first three periods when the D-Index was highest indicates that region, household size, type of place of residence, mother tongue and parental education have all significant and similar levels of contribution to the D-Index. This outlook is naturally reflected in the contribution of circumstance groups in inequality. The contribution of demographic circumstances remained comparatively low due to the sex of the child's negligible contribution, although the household size was an important contributor to inequality. The geographic circumstances were responsible for around one-third of the D-index except in 2018 when the D-index was only 1 percent. Finally, the socioeconomic group was the main contributor to D-Index as in the case of all the other opportunities analyzed so far. The contribution of socio-economic circumstances ranged between 46 and 60 percent for all years.

Panel f in Figure 7-10 presents the decomposition result of HOI between periods. The scale effect dominated the changes in HOI for all periods which ranged between 52 and 61 percent[95]. In the first three periods (1998-1993, 2003-1998, and 2008-2003), both the composition and equalization effects were present with significant contributions to changes in HOI. In the 2013-2008 period, however, the composition effect was negligible and it was replaced by the increase in equalization and scale effects.

7.3.2 Access to Full Antenatal Visit

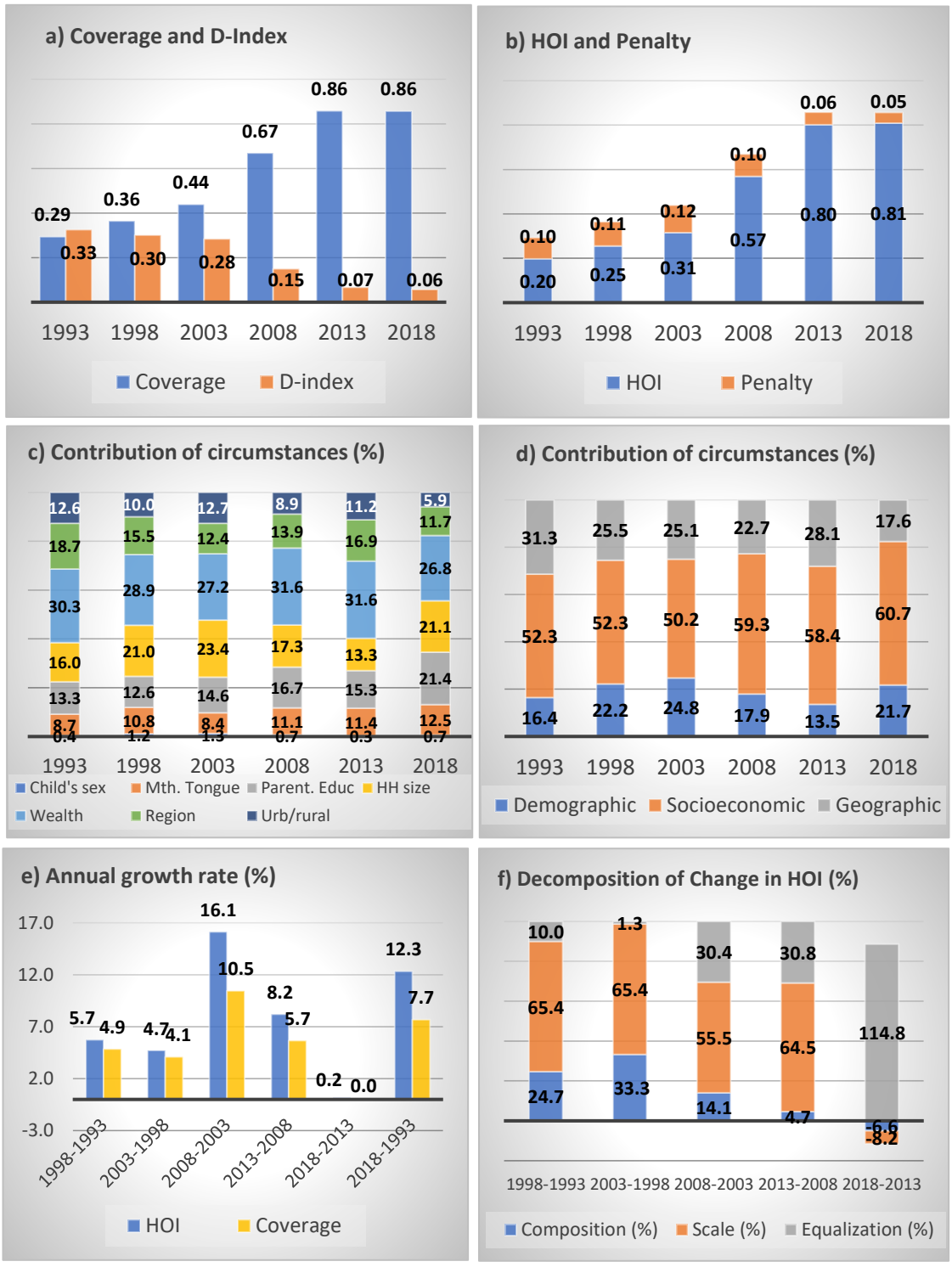
The analysis results for access to full antenatal care are presented in Figure 7-11. Access to full antenatal care expanded substantially in the 2018-1993 period while the inequality in access among circumstances decreased. Despite these

[94] As it will be discussed in the next part, sex of the child also does not contribute to inequality in access to full antenatal care.
[95] The 2018-2013 period is ignored here and in the rest of the analysis since the change in HOI in this period was negligible.

developments, access did not reach a near-universal level and some inequality remained as of 2018. In 1993, the access was only 29 percent, and one-third of this access (D-index) needed to be redistributed for each group to have an equal share of the available access. This level of coverage and dissimilarity led to an HOI of 20 percent, and a penalty of 10 percent in 1993. There was a slight improvement in access and equality in 1998 with the coverage rate and HOI of 36 and 25 percent respectively and D-index and penalty of 30 and 11 percent respectively. In 2003, the access and HOI reached 44 percent and 31 percent respectively and there was a minor reduction in inequality with a D-Index value of 28 percent. The period from 2003 to 2013 experienced the largest improvement in access and inequality. The coverage first increased to 67 percent in 2008 and then to 86 percent in 2013. At this time, the D-index (penalty) reduced to 15 percent (10 percent) in 2008 and to 7 percent (6 percent) in 2013. This major improvement in access and equality from 2003 to 2018 can be attributed to the "Transformation of Health" program implemented during the period. However, there was not an improvement in access or equality from 2013 to 2018. Coverage, HOI, D-Index, and penalty remained almost the same as in 2013 in 2018 signaling that a new approach or an update to the existing one is needed.

The trend in coverage and HOI discussed in the previous paragraphs also reveals itself in the annual growth rates (Panel e). Accordingly, the growth rate from 1993 to 2018 was 12 and 8 percent for HOI and coverage respectively. In the first two periods (1998-1993 and 2003-1998), the annual growth rates were around 5 percent which is quite high but less than the 25-year average. For the next period (2008-2003), the annual rate of increase in HOI and coverage were 16 and 11 percent respectively. With these growth rates, the 2008-2003 period became the fastest growth period. The 2013-2008 period also had a high growth with annual rates of 8 and 6 percent for HOI and coverage respectively. However, this growth trend stopped in the 2018-2013 period and HOI and coverage rate did not increase in 2018 compared to 2013.

Figure 7-11. The coverage rate, D-Index, HOI, penalty and decomposition results for access to full antenatal care (age group 0-4)



Source: Own calculations

Panels c and d of Figure 7-11 indicate the contribution of circumstances to inequality. Like the case of basic antenatal care, all circumstances contribute to inequality except the sex of the child. The differential access by sex of the child was responsible for only 1 percent of the D-Index throughout the whole period. Wealth was the most important circumstance contributing between a quarter and one-third of the inequality for each period. Household size, parental education and region were also important sources of inequality with comparatively larger contributions to D-Index. The contribution of parental education increased over time. The trend of circumstance groups' contribution to the D-Index of access to full antenatal care is very similar to that of basic antenatal care. For all six years, the socioeconomic circumstances were responsible for more than half of the D-Index. For the first 5 periods, the contribution of geographic circumstances was higher (between 23 and 31 percent) than that of demographic circumstances (between 14 and 25 percent). However, this changed in 2018 when the contribution of demographic circumstances was 22 percent which was 4 percentage points higher than the contribution of geographic circumstances.

Panel f in Figure 7-11 presents the decomposition results of the changes in HOI between periods. The scale effect was the main factor in increases in HOI for all periods[96]. The scale effect's contribution ranged between 56 and 65 percent for all 4 periods between 1993 and 2013. The contribution of the change of population's composition among circumstance categories (composition effect) was more pronounced in the 1998-1993 and 2003-1998 periods, but it decreased significantly in the 2008-2003 and 2013-2008 periods when there were large increases in HOI. The equalization effect played a more substantial role in the increases of HOI from 2003 to 2008 and from 2008 to 2013 which can also be seen in the large decreases in inequality in these periods.

7.3.3 Access to Institutional Skilled Delivery

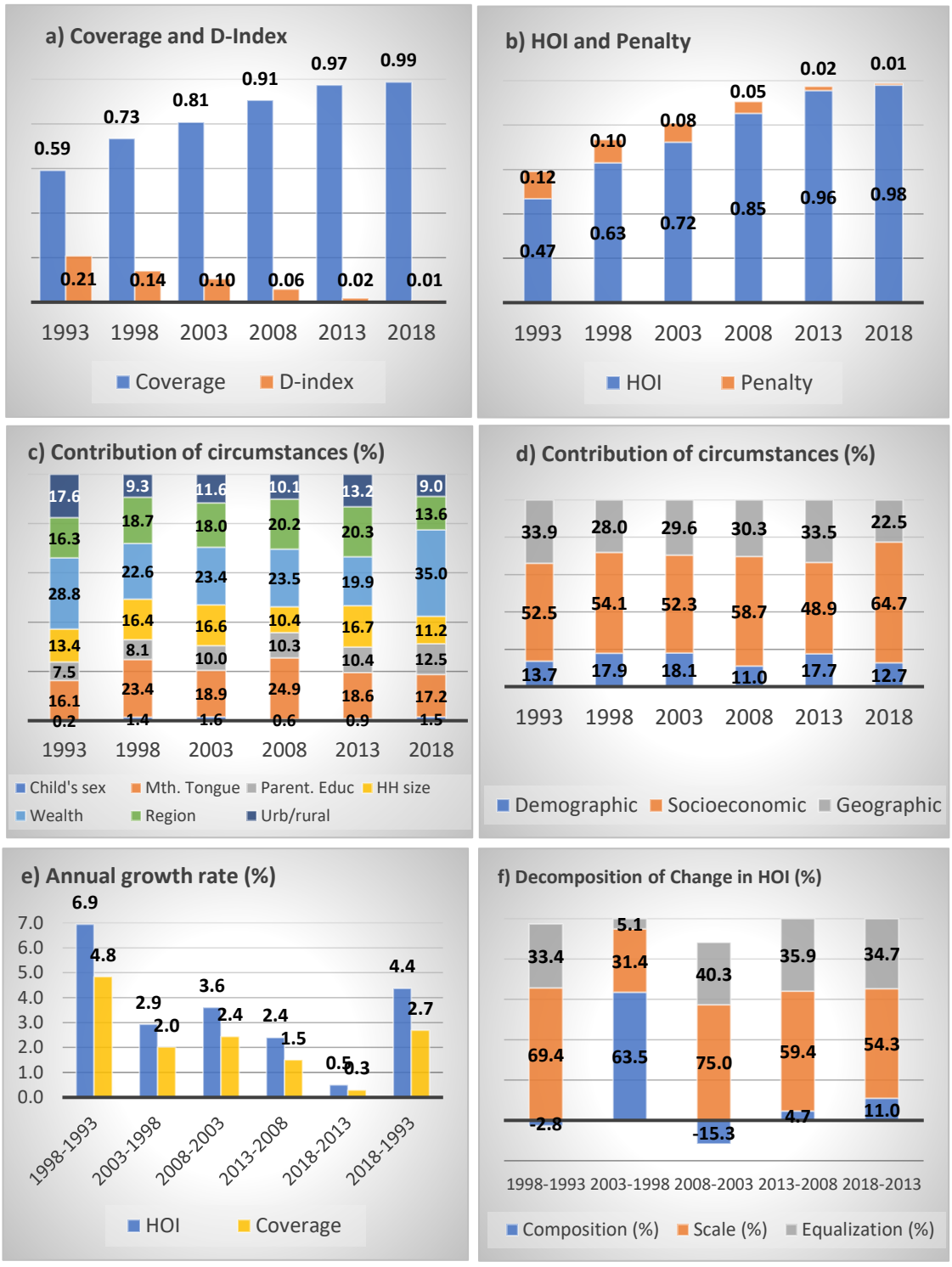
The analysis results for access to institutional skilled delivery are presented in Figure 7-12. There was a substantial and continuous improvement in access and equality from 1993 to 2018 in institutional skilled delivery. In 1993, the coverage of

[96] The 2018-2013 period is ignored here since the change in HOI in this period was negligible.

this opportunity was only 59 percent, and 21 percent (D-Index) of this access needed to be redistributed among circumstance groups to have an opportunity equal distribution. Hence, the HOI was 47 percent and the penalty was 12 percent. The period from 1993 to 1998 experienced a large increase in access and the coverage reached 73 percent. Meanwhile, the inequality decreased to 14 percent (D-Index) which led to a HOI of 63 percent and a penalty of 10 percent. In 2003, the coverage and HOI increased by 9 percent (compared to 1998) and they reached 81 and 72 percent respectively. The same period experienced a further improvement in equality and the D-Index and penalty decreased to 10 and 8 percent respectively. In 2008, the coverage rate reached 91 with a D-index of 6 percent. As a result, the HOI and penalty were 85 and 5 percent respectively. The advancement in access continued from 2008 onwards although it already reached a high level. Consequently, the access and HOI increased to 97 and 96 percent in 2013 and 99 and 98 percent in 2018, and the access became universal. At this time, the inequality became negligible implying an equal (and almost full) level of access for all circumstance groups.

The high growth in access and HOI over time can also be seen from the annual increase rates (Panel e in Figure 7-12). The annual increase rate was 4.4 and 2.7 percent for HOI and coverage respectively between 1993 and 2018. A higher annual rate of increase in HOI compared to coverage is a sign of opportunity equalizing growth in 25 years. The highest rate of increase took place in the 1998-1993 period with 7 and 5 percent annual increases in HOI and coverage. In the following period (2003-1998), the pace of the growth decreased although the rate of increase was substantial with 3 and 2 percent in HOI and coverage respectively. The second fastest growth happened in the 2008-2003 period, around 3 percent for each indicator with the contribution of increased health investments in this period. In the 2013-2008 period, the growth continued at a decreased rate (2.4 and 1.4 percent) and the growth became negligible in the 2018-2013 period due to reaching a universal level of access in 2013 with a negligible level of inequality.

Figure 7-12. The coverage rate, D-Index, HOI, penalty and decomposition results for access to institutional skilled delivery (age group 0-4)



Source: Own calculations

Panels c and d in Figure 7-12 demonstrate the contribution of circumstances to inequality. Like other health-related opportunities, differential access among wealth categories is the most important contributor to D-Index accounting for between 23 and 29 percent of the D-Index[97]. Looking at the contribution throughout the period, the mother tongue is the second important contributor to inequality which was responsible for between 16 and 25 percent of D-Index. The region was also a factor contributing between 16 and 20 percent to the D-Index. The type of place of residence contribution was especially high in 1993. Differential access with respect to the sex of the child was not a source of inequality for all years. As for the circumstance groups, differential access among different socioeconomic circumstances was the main contributor to inequality explaining more than half of the D-index. Geographic circumstances were responsible for around 30 percent of the D-index. Although the sex of the child was not a contributor to the inequality, the demographic circumstances' contribution was also meaningful (11-18 percent) thanks to the household size.

Panel f in Figure 7-12 presents the decomposition results of changes in HOI between periods. A proportional increase of access among all circumstance categories (scale effect) was the main driver of the improvement in HOI in all periods except the 2003-1998 period. For the remaining periods, the scale effects explained between 54 and 75 percent of the change in HOI. Equalization was also in place for all periods except the 2003-1998 period. Its contribution was positive and between 33 and 40 percent. The composition's contribution to changes in HOI followed an irregular pattern. In the 1998-1993 period, its contribution was negative and small. In 2003-1998, it was the main driver of the 8-percentage point increase in HOI. In 2008-2003, its contribution was negative and significant (15 percent).

7.3.4 Access to Postnatal Visit (Child)

The analysis results for access to newborn's access to postnatal visit are presented in Figure 7-13. This opportunity is among the very few opportunities in this study access to which is worsened over time. In 2003, only 81 percent of the newborns

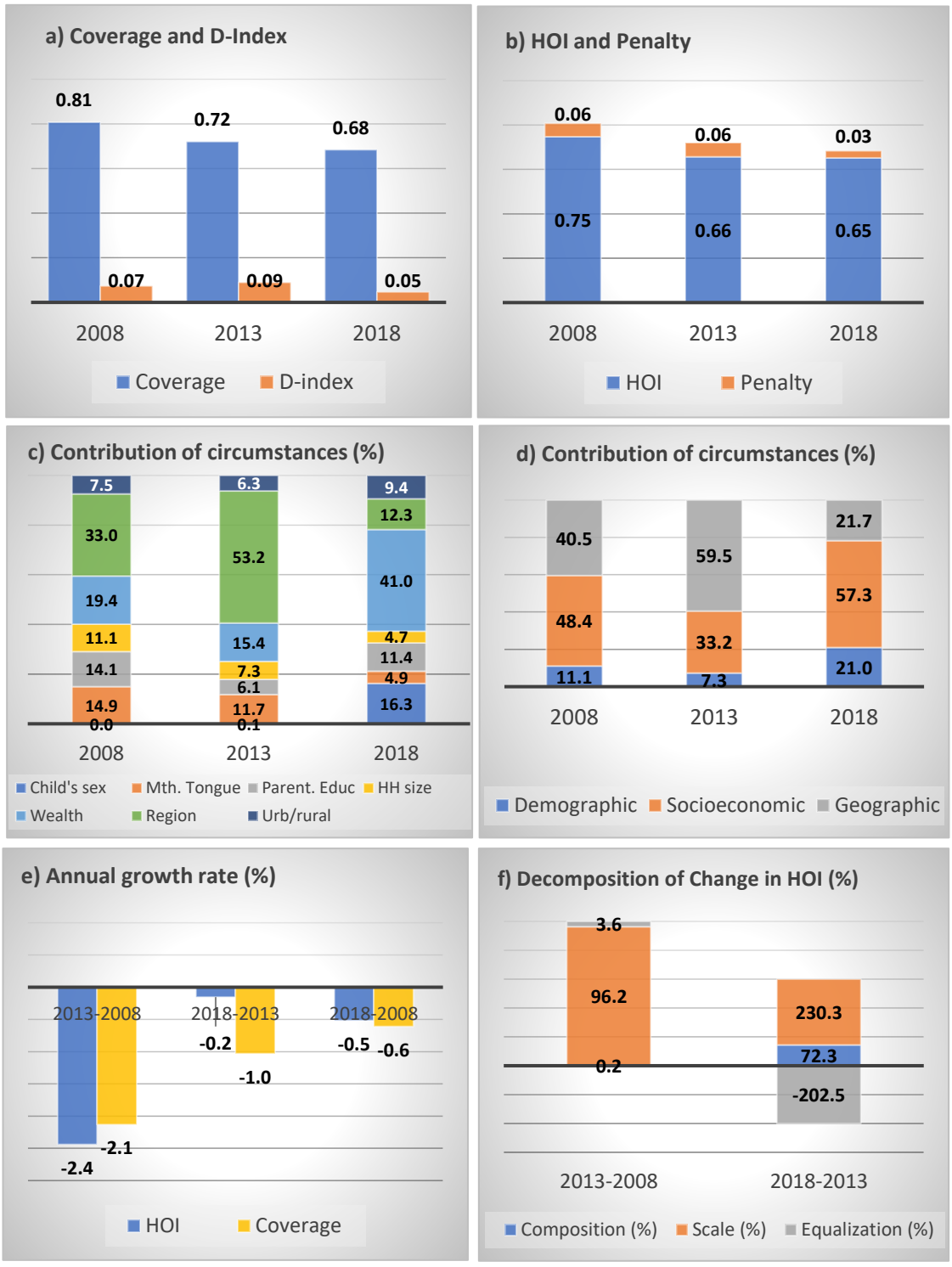
[97] Since the D-Index was negligible in 2013 and 2018, the analysis here and in the rest of the chapter focused only on 1993, 1998, 2003 and 2008.

were receiving a postnatal check-up from a medical professional, and the D-index was 7 percent indicating that 7 percent of the available access was not distributed in line with the EOP principle. As a function of coverage and D-index, the HOI and penalty were 75 and 6 percent respectively. From 2003 to 2008, both the coverage and HOI decreased by 9 percentage points to 72 and 66 percent respectively. The D-Index rose to 9 percent at this time. Although the inequality worsened (D-Index increased), the penalty remained the same at 6 percent since there was increased inequality in the distribution of fewer opportunities. The access continued to deteriorate from 2013 to 2018, but the equality improved. In 2018, the coverage rate and HOI were 68 and 65 percent respectively and the D-index and penalty were 5 and 3 percent respectively. The lower fall in HOI from 2013 to 2018 compared to coverage was due to the reduction in inequality, which can also be seen from the size of the equalization effect in Panel f of Figure 7-13.

The overtime reduction in HOI and coverage is also reflected in the negative increase rates in Panel e. For the ten years from 2008 to 2018, the coverage and HOI decreased by 0.6 and 0.5 percent annually. In the 2013-2008 period, the annual rate of decrease was a little higher than 2 percent for both indicators. In the following period, the rate of decrease was higher for coverage (1 percent) compared to HOI (0.2 percent).

Panels c and d in Figure 7-13 show the contribution of circumstances to inequality. Region and wealth were the major contributors to inequality over time. They accounted for between half and two-thirds of the D-Index. Mother tongue and parental education were also important contributors to the D-Index in 2008 but their share declined over time. The contribution of the sex of the child was nonexistent in 2008 and 2013, however, it was an important factor in the inequality in 2018 by contributing 16 percent of the D-index. The contribution of urban-rural differentials and household size was limited throughout the period.

Figure 7-13. The coverage rate, D-Index, HOI, penalty and decomposition results for access to postnatal care (age group 0-4)



Source: Own calculations

Panel f in Figure 7-13 reveals the decomposition results of changes in HOI between periods. From 2008 to 2013, the decrease in HOI was dominated by the proportional decrease in all circumstances (scale effect) while the impact of composition and equalization was negligible. From 2013 to 2018, however, all of the factors were in place, but the scale factor was the main reason behind the decline in HOI. The change in the composition of the population among circumstance categories (composition effect) also contributed significantly to the decline. However, the equalization (improvements in OVG's access without changing the overall coverage) had a large and negative contribution to the decrease in HOI, but it was not enough to surpass the contribution of scale and composition effects and the result was a 1 percent decrease in HOI.

7.3.5 Access to Immunization

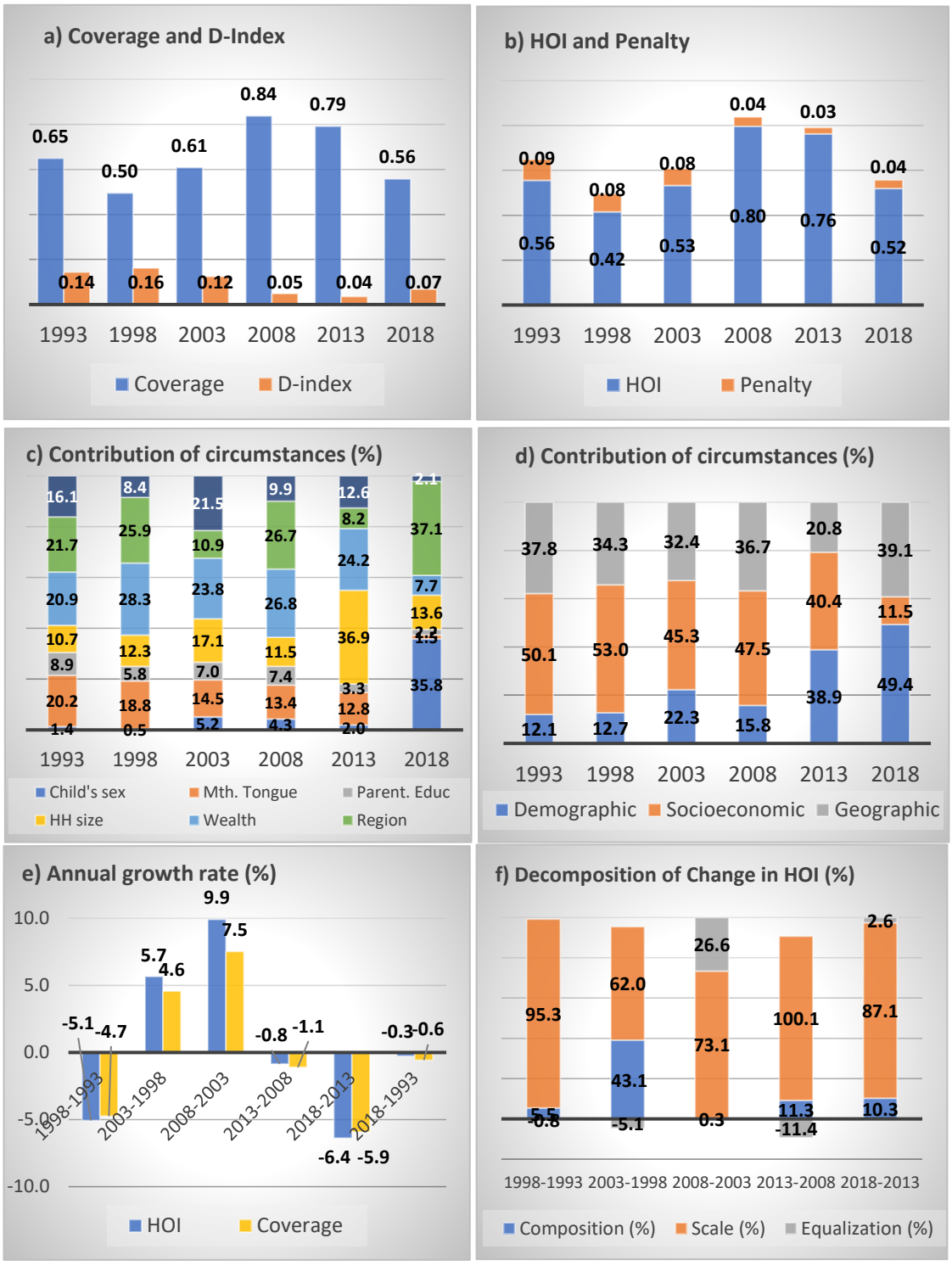
The analysis results for access to full vaccination are presented in Figure 7-14. All the indicators related to this opportunity followed a fluctuating course over 25 years. In 1993, 65 percent of children received all the age-appropriate vaccinations with a D-Index of 14 percent. This level of coverage and dissimilarity in the distribution of access among circumstance groups generated an HOI of 56 percent and a penalty of 9 percent. Hence, 56 percentage points of the available opportunity (65 percent) were distributed in line with the EOP principle and the remaining 9 percentage points were distributed unfairly. The share of fully immunized children declined significantly to 50 percent from 1993 to 1998 and the equality in the distribution of access worsened leading to a D-index of 16 percent. Consequently, the HOI was reduced to 42 percent. However, the penalty improved (decreased) slightly despite the increase in D-index. The period between 1998 and 2003 experienced an increase in coverage rate but the coverage in 2003 (61 percent) was still lower than that of in 1993 (65 percent). The inequality had also improved in this period with a reduction in the D-index to 12 percent. Hence, the HOI and penalty were 53 and 8 percent in 2003. The improvement trend from 1998 to 2003 continued in the next 5 years and the coverage and HOI reached 84 and 80 percent respectively in 2003. The inequality also improved in the same period with a D-index of 5 percent and a penalty of 4 percent. From 2008 onwards, the share of children who received all age-appropriate vaccinations started

to decrease and the coverage fell to 79 and 56 percent in 2013 and 2018 respectively. Meanwhile, the D-index first decreased to 4 percent in 2013 but then increased to 7 percent in 2018. As a result of these changes, the HOI was 76 and 52 percent in 2013 and 2018 respectively and the penalty was 3-4 percent. As of 2018, access to full immunization was very low at 56 percent and 52 percentage points of this coverage was distributed in line with the EOP principle among the circumstance groups.

The ups and downs in access rate and HOI can also be seen in the annual growth rates (Panel e). The overall annual growth rate was negative for the whole period at 0.3 and 0.6 percent for HOI and coverage respectively. The annual rate of change for HOI (coverage) was -5.1, 5.7, 9.9, -0.8, and -6.4 percent (-4.7, 4.6, 7.5, -1.1, and -5.9 percent) for all 5-year periods respectively. Interestingly, the absolute value of the annual growth rate for HOI was larger than that of coverage (except in the 2013-2008 period) for all periods. This indicates that the changes in HOI were faster in both ways (decrease and increase).

Panels c and d in Figure 7-14 show the contribution of circumstances to inequality. A general review suggests that several circumstances contributed to D-Index in each year and these circumstances changed from one year to another. For example, in 1993 and 1998, the most important circumstances in terms of their contribution to inequality were wealth, region, and mother tongue. They were responsible for between 63 and 73 percent of the D-Index. The type of place of residence also contributed significantly (16 percent) to D-Index, whereas this contribution halved in 1998. In 2003, on the other hand, wealth, type of place of residence, and household size were the main sources of inequality (62 percent of D-index). In 2008, only two circumstances, namely wealth and region, were the main sources of inequality accounting for 54 percent of the D-index. In 2013, again two circumstances, but household size and wealth this time, were the main contributors to inequality (61 percent of D-index). Finally, in 2018, 73 percent of the D-index stemmed from the differential access among sexes and regions. In addition, 2018 was the only year when the sex of the child was an important source of inequality.

Figure 7-14. The coverage rate, D-Index, HOI, penalty and decomposition results for access to full immunization[98]



Source: Own calculations

Panel f in Figure 7-14 presents the decomposition results of changes in HOI between periods. However, it is relatively more complicated to interpret these figures since the HOI decreased between some periods and increased in others. The HOI decreased by 14 percent from 1993 to 1998 and almost all of this decrease was due to the proportionate decrease in access in all circumstance groups (scale effect). From 1998 to 2003, the HOI improved by 11 percent thanks to the proportionate increase in access in all circumstance groups (scale effect) and the change in population shares of circumstance groups (composition effect). From 2003 to 2008, there was a substantial improvement in HOI and all this improvement came from the scale effect and equalization effect. In the following period (2013-2008), the HOI decreased slightly due to proportional declines in all circumstance groups (scale effect). In this period, the equalization effect was negative indicating an improvement in circumstance-specific coverage differential. There was a substantial decline in HOI from 2013 to 2018 and this decline was dominated by the scale effect with small contribution from composition and equalization.

7.3.6 Non-Stunting

The analysis results for non-stunting are presented in Figure 7-15. In the period between 1993 and 2018, non-stunting (share of non-stunted children) increased steadily and the inequality in its distribution declined. As a result, access became almost universal with a negligible level of inequality. The prevalence of non-stunting was 76 percent in 1993 and 8 percent (D-index) of this share needed to be redistributed among circumstances to ensure equal access for each group. As a result of these figures, the HOI and penalty were 70 and 6 percent respectively. From 1993 to 1998, both the access and HOI improved (to 81 and 76 percent respectively) and inequality diminished (D-index 6 percent and penalty 5 percent). These improvements continued in the following period (2003-1998), and coverage and HOI reached 89 and 85 percent respectively. Meanwhile, the D-index and penalty were reduced to 4 percent. The 2008-2003 period experienced minor advancements in coverage, HOI, and penalty (90, 87, and 3 percent), but the D-index remained the same in 2008. The progress in

[98] The age groups are identified according to the vaccination guidelines of the Ministry of Health. Refer to the immunization sections in HUIPS (1994, 1999, 2004, 2009, 2014, 2019) for more detail.

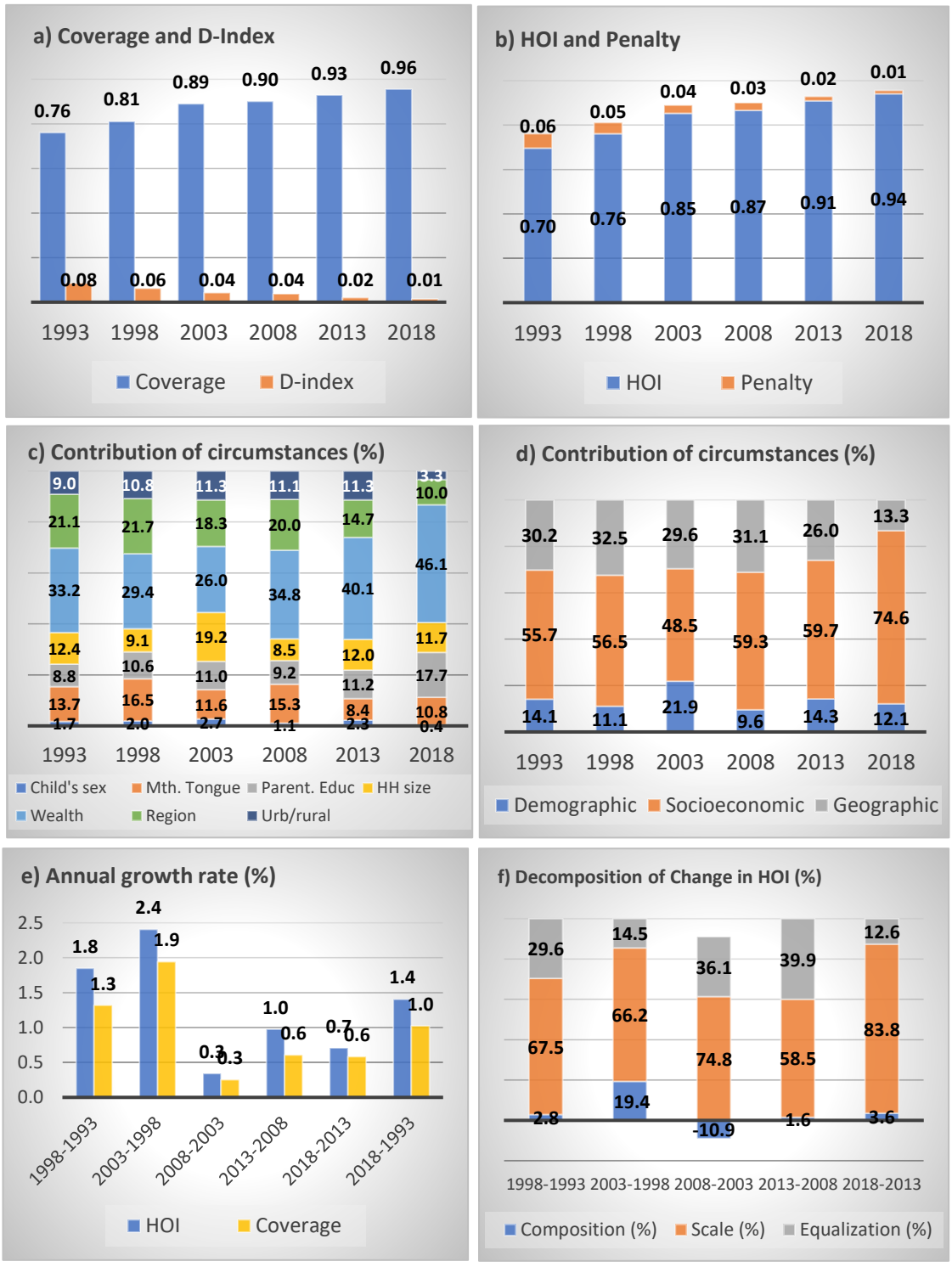
access and equality endured in the 2013-2008 and 2018-2013 periods and coverage and HOI increased to 93 and 91 percent in 2013 and 96 and 94 percent in 2018 respectively. With near-universal coverage in these years, the D-index and penalty reduced to negligible levels.

The annual growth in coverage and HOI was 1 and 1.4 percent respectively for the whole period (see Panel e in Figure 7-15). In the first two periods (1998-1993 and 2003-1998), the growth rate was above the 25-year average with 1.8 and 2.4 annual increase rates in HOI and 1.3 and 1.9 percent increase rates in coverage. The second period was the period in which both indicators grew fastest. The rate of increase was lowest in the 2008-2003 period (0.3 percent for both). The annual rate of increase was 1 and 0.6 percent for HOI and coverage respectively in the 2013-2008 period and around 0.6-0.7 percent for both in the 2018-2013 period.

Panels c and d in Figure 7-15 present the contribution of circumstances to inequality. Wealth and region were the main contributors to D-Index for the whole period[99]. These two circumstances were responsible for around half of the D-index. Mother tongue's contribution to inequality was also significant in 1993, 1998, and 2008. In addition, household size was a meaningful source of inequality in 2003. The contribution of parental education and type of place remained at around 10 percent in all years. The sex of the child's contribution to D-Index was insignificant for the whole period. As for circumstance groups, socioeconomic circumstances were the main contributor to D-Index, the contribution ranging between 49 and 59 percent. The geographic circumstances were the second significant contributor to inequality accounting for around one-third of the D-index. The contribution of demographic indicators was around between 11 and 22 percent.

[99] Since the D-Index was negligible in 2013 and 2018, the analysis here and in the rest of the chapter focused only on 1993, 1998, 2003 and 2008.

Figure 7-15. The coverage rate, D-Index, HOI, penalty and decomposition results for non-stunting (age group 0-4)



Source: Own calculations

Panel f in Figure 7-15 presents the decomposition results of changes in HOI between periods. The scale effect was the dominant factor in the increase in HOI for all periods. Its contribution ranged between 59 and 84. Equalization also contributed significantly to the increases in HOI in the 1998-1993, 2008-2003 and 2013-2008 periods. The composition effect was negligible for most of the periods except for 2003-1998 and 2008-2003.

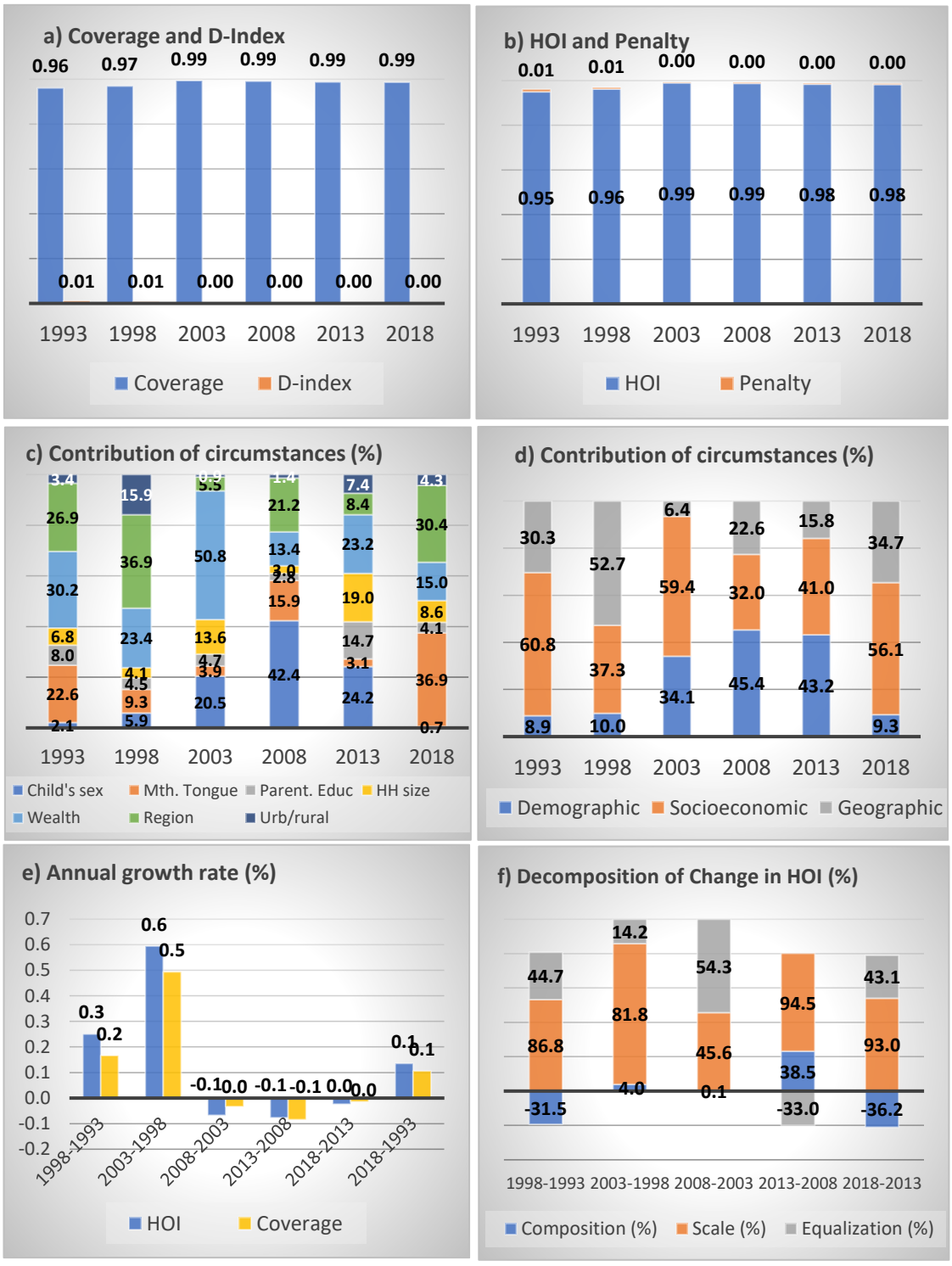
7.3.7 Non-Wasting

The analysis results for non-wasting are presented in Figure 7-16. The share of wasted children was very low during the whole period. Therefore, it can be concluded that non-wasting was almost universal among children under the age of 5 from 1993 to 2018. This universal access naturally resulted in a negligible level of inequality (both D-index and penalty) and HOI values that were very close to the coverage rate. The coverage rate, which was 96 percent in 1993, rose to 99 percent in 2003 and remained the same in 2008, 2013 and 2018. The D-index was negligible (1 percent or less) for the whole period. As a result, the HOI fluctuated above 95 percent in the whole period.

The annual growth rate for both coverage and HOI was the same (0.1 percent) from 1993 to 2018. The first two periods faced some growth in coverage and HOI with an annual increase rate of around 0.2-0.3 percent from 1993 to 1998 and around 0.5-0.6 percent from 1998 to 2003. For the remaining periods, the annual growth rate was very close to zero indicating no or little change in coverage and HOI.

Although the D-index was insignificant for the whole period, Panels c and d in Figure 7-16 present the contribution circumstances to the D-index for indicative purposes. Wealth, region, and mother tongue were significant factors in the D-index value in 1993. In 1998, wealth and region were still important circumstances in the limited inequality but the type of place of residence was the third important circumstance instead of the mother tongue. Looking at the aggregate level of contribution of circumstances, the socioeconomic and geographic factors were the main drivers of inequality in 1993 and 1998.

Figure 7-16. The coverage rate, D-Index, HOI, penalty and decomposition results for non-wasting (age group 0-4)



Source: Own calculations

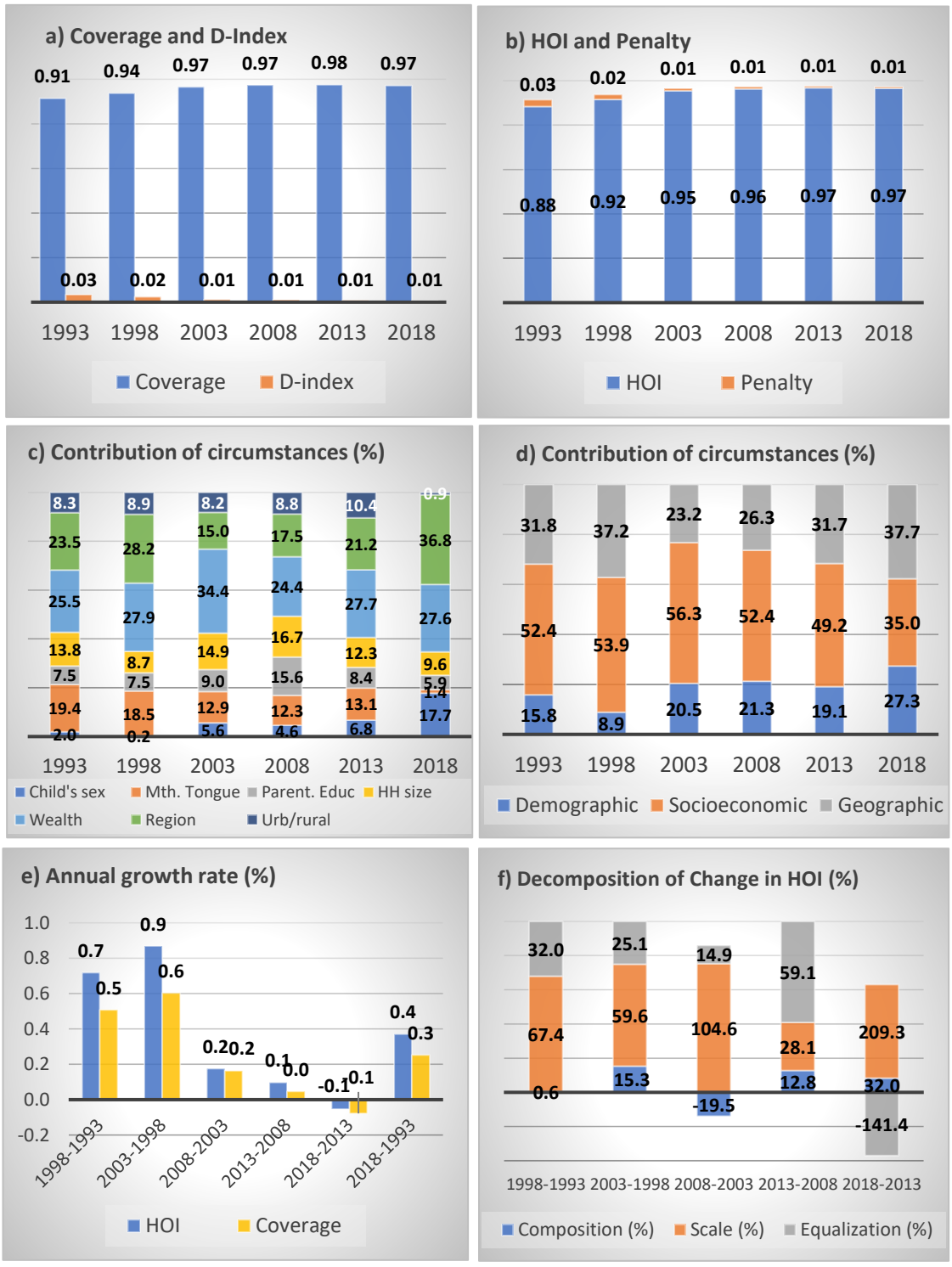
Panel f in Figure 7-16 presents the decomposition results of changes in HOI between periods. The change in HOI from one period to another was very limited for non-wasting, but these small changes were mainly driven by the scale effect and equalization effect in the 1998-1993 and 2003-1998 periods. In the 2013-2008 period, the 1 percent decline was thanks to scale and composition effects. In this period, the equalization effect contributed negatively to the decline.

7.3.8 Non-Underweight

The analysis results for non-underweight are presented in Figure 7-17. As in the case of wasting, the prevalence of underweight was low among children at the beginning of the period and it decreased further until 2018. A similar improvement occurred also in the EOP. In 1993, the share of children who were non-underweight was 91 percent while 3 percent (D-index) of this needed to be redistributed for EOP to prevail. These figures led to an HOI of 88 percent and a penalty of 3 percent in 1993. In 1998, the coverage reached 94 percent while the D-Index declined to 2 percent. These led to a 4-percentage point increase in HOI (92 percent). The 2003-1998 period faced further improvement and access became almost universal with coverage and HOI at 97 and 95 percent respectively. After 2003, the coverage remained at around 97-98 percent with negligible levels of inequality leading to a HOI value of around 96-97 percent.

The annual growth rate in coverage and HOI were 0.3 and 0.4 percent respectively for the whole period. The rate of growth was above the 25-year average in the first two periods, but they were still less than 1 percent (0.7 and 0.9 percent for HOI and 0.5 and 0.6 percent for coverage). In the last three periods (2008-2003, 2013-2008, and 2018-2013), the annual rate of increase fluctuated between -0.1 percent and 0.2 percent.

Figure 7-17. The coverage rate, D-Index, HOI, penalty and decomposition results for non-underweight (age group 0-4)



Source: Own calculations

Panels c and d in Figure 7-17 present the contribution circumstances to the D-index. However, the interpretation of this decomposition might not be meaningful for 2003, 2008, 2013, and 2018 since the D-Index was insignificant in these years[100]. In 1993 and 1998, differential access among different wealth, region, and mother tongue groups was the main factor in inequality. These three circumstances accounted for 70 percent of the D-Index in both periods. The sex of the child was not a source of inequality except for 2018.

Panel f in Figure 7-17 presents the decomposition results of changes in HOI between periods[101]. The increases in HOI from 1993 to 2008 are dominated by the scale factor suggesting a proportional increase in access for all circumstance groups. Equalization's contribution was also significant for the 1998-1993 and 2008-2013 periods. In fact, equalization was the dominant factor in the increase in HOI for the latter period. The composition had limited effect on the changes except for the 2013-2008 period when the composition's contribution was negative.

7.3.9 Non-Overweight

The analysis results for non-overweight are presented in Figure 7-18. Non-overweight is one of the few opportunities in this study access to which deteriorated in the 2018-1993 period. More interestingly, this deterioration was not accompanied by increased inequality, rather the inequality remained negligible for all six years suggesting a rise in the share of overweight children in all circumstance groups. In 1993 and 1998, non-overweight was almost universal (98 percent) among children under the age of 5. Due to the negligible levels of inequality, the HOI for these years was 98 percent which is the same as the coverage rate. In the 2003-1998 period, the share of non-overweight children declined by 3 percentage points and the coverage reached 95 percent in 2003. In the same period, HOI decreased by 4 percentage points to 94 percent. The 2008-2003 period faced another, but a limited, decline, and the coverage and HOI fell to 94 and 93 percent respectively in 2008. In this period, the D-

[100] The same argument may apply to 1993 and 1998 but decomposition reuslt for these years are interpreted for indicative purposes.
[101] Since the change in HOI was negligible from 2013 to 2018, the analysis here do not consider this period.

index rose to 2 percent. From 2008 onwards, both the coverage and HOI remained the same at 94 percent and 92-93 percent respectively and the inequality indicators were at 1 percent.

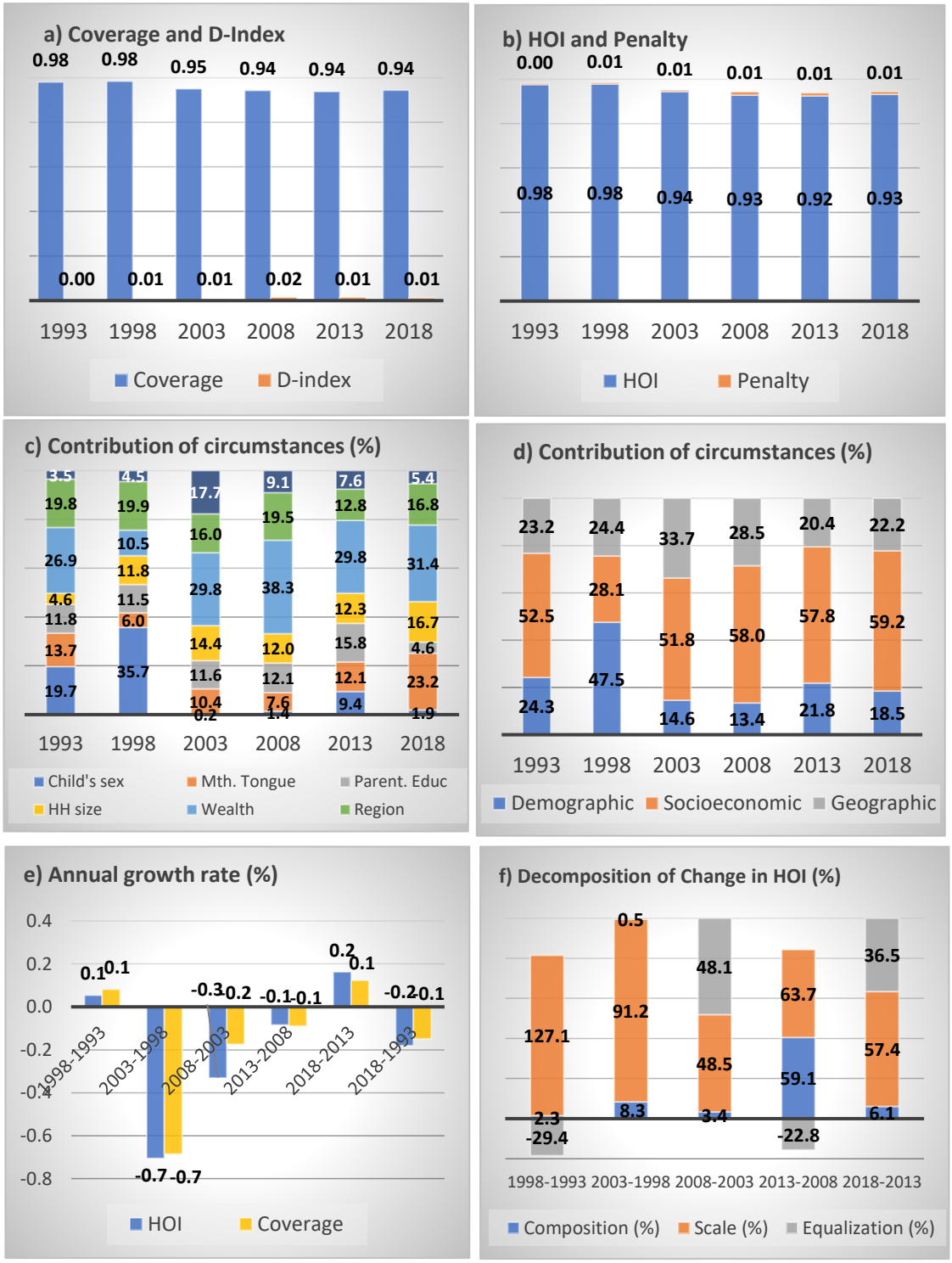
The annual rate of decrease was 0.1 and 0.2 percent for coverage and HOI. The higher decrease rate in HOI relative to coverage signals some deterioration in equality. The highest rate of decrease occurred in the period from 1998 to 2003 although it was still limited at 0.7 for both coverage and HOI. The remaining period faced annual rates in the proximity of zero.

Since the inequality was very limited the interpretation of the decomposition of the D-index into circumstances might not be meaningful but this analysis is given in Panels c and d of Figure 7-18 for indicative purposes. Accordingly, in the limited inequality that prevailed for the whole period, wealth and region played a more pronounced role compared to other circumstances. The sex of the child was especially important in 1993 and 1998.

Panel f in Figure 7-18 presents the decomposition results of changes in HOI between periods[102]. In the decline in HOI from 1998 to 2003, the scale effect was the main factor accounting for 91 percent of the reduction. This suggests that all circumstance groups experienced similar levels of decrease in access which can also be seen by comparing the D-Indexes for both years. The limited decrease (1 percent) in HOI from 2003 to 2008 was thanks to the scale and equalization effect. The contribution of the equalization effect was also reflected in the increase in D-Index. From 2008 to 2013, the HOI index fell by 1 percentage point with significant contribution from scale (64 percent) and composition (59 percent) effects. The equalization contributed negatively to this reduction (D-index reduced by 1 percent). Finally, in the last period, there was a 1 percentage point increase in HOI largely due to scale and composition effects.

[102] The result for 1998-1993 period is not interpreted here since the change in HOI for this period was negligible.

Figure 7-18. The coverage rate, D-Index, HOI, penalty and decomposition results for non-overweight (age group 0-4)



Source : Own calculations

8. DISCUSSION

The previous chapter looked at the level of and inequality in access to 18 opportunities and identified the main drivers of inequality and the changes in equality. This chapter will discuss these results for both individual opportunities and try to develop recommendations for decision-makers.

The results indicate that access and equality have improved for the majority of opportunities. Since the characteristics of the opportunities in the basic infrastructure category are significantly different from each other, these opportunities are discussed one by one below.

For safe water, the access was high at the beginning of the period, and it remained so for the whole time. Meanwhile, the variation in access among different circumstance groups, i.e. IOP, was negligible. As a result, the HOI was higher than 90 percent indicating near-universal access and very low inequality. To ensure perfect EOP, the policymakers should focus on regional, urban/rural, and wealth differences in access and establish the targeting mechanisms and policy interventions accordingly.

For improved sanitation, access improved significantly in the period of interest while the prevailing IOP diminished. As of 2018, almost every child has access to an improved and unshared toilet facility. As a natural result of the dynamics in access and inequality, the HOI reached 92 percent and above from 2013 onwards suggesting more than 92 percent of the access to improved sanitation is in line with with the EOP principle. The interventions that address the access of OVG (equalization) and overall population (scale) were the main drivers of improvements in HOI from 1993 to 2018. The policymakers should focus on differential access among wealth and urban/rural groups if they want to eliminate prevailing (limited) inequality.

Computer ownership at home increased remarkably from 2 percent in 1993 to 41 percent in 2018 and this improvement was accompanied by a significant decrease in inequality (from 78 to 34 percent) leading to a HOI of less than 1 percent in 1993 to 27 percent in 2018. Although the improvement is impressive, the current level of access and inequality is alarming. Failing to address this problem may result in losses

in human capital at individual and national levels in the long term and limit the nation's gains from the existing population dynamics. Policymakers should focus on increasing the access of all circumstance groups but prioritize the differential access among different socioeconomic groups, especially wealth since wealth is the major source of inequality.

Internet access among children followed a similar pattern to access to computer. The initial level of access was very low (5 percent in 2003) with massive inequality (a D-Index of 78 percent). These figures improved significantly in 2018 with a coverage rate of 44 percent and a D-Index of 33 percent. These led to a 14 percent annual rate of increase in HOI and HOI increased from 1 percent in 2003 to 30 percent in 2018. Both the improvement in access of OVG and the increase in overall access played a significant role in the increase in HOI. However, the current level of access is far from being universal and a significant level of inequality opportunity prevails. This may leave the children from disadvantaged groups behind in an ever-more digitalizing world. The policymakers need to specifically address the differential access among different wealth groups to decrease IOP. It is interesting to note that computer ownership and internet access which are among the few services that are not provided publicly are the two opportunities with the lowest access and highest inequality.

Birth registration is a prerequisite for children to enjoy many rights and access to opportunities. The share of children with birth registration increased remarkably from 1993 to 2018 and it became almost universal from 2008 onwards. This increase was accompanied by a decreasing level of inequality leading to 97 percent HOI in 2018. This suggests that 97 percentage points of the 98 percent access is distributed in line with the EOP principle among circumstance groups. To eliminate the prevailing modest level of inequality, policymakers should prioritize the differential access among wealth and mother tongue groups.

All the education-related opportunities (i.e. starting primary education on time, attendance to primary school, completion of primary school and attendance to primary school) followed a similar pattern in terms of access and inequality over time. Their

coverage rate improved significantly while the inequality diminished. As of 2018, access to starting primary education on time, attendance to primary school, and completion of primary school are almost universal (95 percent or higher) and the inequality indicators for these opportunities are at a negligible level (2 percent or less). The case of secondary school attendance is slightly different. Enrollment in secondary school also rose significantly from 1993 to 2018 but remained at a comparatively low level of 90 percent. It also exhibited a relatively higher inequality (5 percent D-Index and 4 percent penalty). Consequently, the HOI was 86 percent for secondary school enrolment which suggests 86 percentage points of the access (90 points) distributed in line with the EOP principle. These findings show that the education reforms in 1997 and 2012 (extension of mandatory education to 8 years in 2012 and 12 years in 2013) provided a boost in access to primary education and addressed the inequality at the primary education level. However, the access and inequality challenges persist at the secondary education level and targeted interventions are needed at this level. The decomposition results indicate that differential access among children from different wealth, mother tongue, and parental education groups is the main driver in inequality in secondary education. Policymakers should prioritize these disadvantaged groups in their interventions. In addition, the comparison of growth rates for different periods demonstrates that the fastest growth period in access to all four opportunities was the 2003-1998 and 2008-2003 periods. Furthermore, access to education is only one side of the coin. The quality of education and the impact of circumstances on education outcomes is the other side of the story. The ultimate goal should be providing quality education to all as it is defined in SDG 4 (Quality Education). Although the level and equality in access vastly improved in Türkiye since 1993, quality of the education is still problematic. For example, the Programme for International Student Assessment (PISA) in 2022 revealed that Turkish students did significantly less than the OECD average in all three tests. Turkish students scored 453, 456, and 476 points in mathematics, reading, and science compared to the OECD averages of 472, 476 and 485 points. Consequently, Türkiye ranked 32 in mathematics, 34 in science, and 30 in reading among 37 OECD countries. These scores placed Türkiye in the category of countries that did statistically significantly below the OECD average. PISA 2022 results also indicate large performance gaps between children from different

backgrounds. For example, socio-economically advantaged students outperformed disadvantaged students by 82 points in mathematics. Furthermore, socioeconomic background explained 13% of the differences observed in mathematics performance. PISA 2022 also showed some positive results regarding the inequality of Türkiye. For example, most disadvantaged students in Türkiye performed better than students from similar backgrounds from other countries in mathematics. In addition, the score difference between (socioeconomically) advantaged and disadvantaged students in Türkiye is lower than the OECD average. Regarding the gender performance differentials, the 2022 PISA findings indicated comparable performance between male and female students in mathematics, while girls surpassed boys by 25 score points in reading. The proportion of students with low performance is alike in mathematics for both boys (38%) and girls (39%). However, in reading, a larger percentage of boys fall into the low-performance category compared to girls[103]. Thus, Türkiye might have a large progress in access to education, but there is a way to go in education quality and persisting IOP in education outcomes.

Access to antenatal health care services improved remarkably from 1993 to 2018. The share of mothers with access to basic antenatal care, defined as mothers having at least one visit to a trained medical staff within the first four months of pregnancy, increased by 35 percentage points and reached 97 percent in 2018. Meanwhile, the inequality in access decreased from 19 percent to 1 percent. Hence, the access to this opportunity became almost universal implying a negligible level of inequality. However, access to full antenatal care is far from being universal although its coverage rate advanced remarkably. As of 2018, the HOI for full antenatal care is 81 percent as a result of an 86 percent coverage rate and 6 percent D-Index. Hence, there is some level of inequality in access too. These indicate that the government should invest further in these areas to increase access and prioritize addressing the differential access among pregnant women from different, wealth, household size, and education groups to eliminate the IOP.

[103] The discussion regarding PISA 22 result came from the following sources: OECD(2023a,b) and MEB (2023).

Similar to the increase in basic antenatal care, access to assisted institutional delivery rose by 40 percent from 59 percent in 1993 to 99 percent in 2018 meanwhile the inequality diminished. This implies that women from all circumstance groups are delivering their babies in medical facilities under the supervision of trained personnel (universal access). Policymakers should monitor access to this opportunity and ensure the continuation of universal access. Furthermore, the quality[104] of the delivery service should also be monitored by professionals and improved if there is a need.

The pattern for children's access to postnatal care is quite the opposite of the pattern of the previous three healthcare services. The share of newborns receiving postnatal checks within two days after birth by a trained medical staff decreased from 81 percent in 2008 to 68 percent in 2018. Interestingly, the inequality in access has also decreased in the same period (D-Index from 7 to 5 percent) leading to an HOI of 65 percent in 2018. Hence, the access that aligns with equality of principle was only 65 percent in 2018. This is highly unexpected considering that almost all births are happening in hospitals or similar medical facilities. The decision-makers should monitor and investigate this unexpectedly low access to postnatal care[105]. In addition, future interventions should focus on increasing access at scale while prioritizing low-wealth groups and regional differences.

The share of children who received all the age-appropriate vaccines in line with the Ministry of Health's vaccine list followed a fluctuating pattern. The access to full vaccination was 65 percent in 1993. It decreased by 15 percentage points in 1998 but then increased by 24 percentage points in the 2008-1998 period. It has been declining ever since and reached down to 56 percent in 2018. The inequality steadily decreased from 1993 to 2013 (from 14 to 4 percent) despite the ups and downs in access. Yet, it

[104] Here, the term quality refers to the quality of health services such as availability of /accessibility to of skilled medical personnel, availability of necessary equipment, the time that can be allocated for the patient etc.

[105] A possible explanation for this might be that children are actually receiving postnatal care during the time mother and the child spend in the hospital, and mothers are not aware of this or they do not accept the control received after the birth as a postnatal check and might be reporting accordingly. This is highly likely considering that almost all the deliveries are occurring in a medical facility and the share of abortion is rising which requires the mother and child spend prolonged time in the medical facility.

increased to 7 percent again in 2018. The HOI naturally followed a similar pattern to the level of coverage and inequality. In 2018, the HOI value was 52 percent. The drivers of inequality in full vaccination are the sex of the child and regional differences. The TDHS 2018 data suggest that girls and children in the south region are less likely to be fully immunized compared to boys and children living in the west and east regions. Policymakers should focus on increasing vaccine accessibility, raising awareness of the benefits of vaccines, and fighting with the anti-vaccination movement to increase access and eliminate existing inequalities.

As of 2018, access to all four nutrition-related opportunities is nearly universal and the level of inequality (D-Index) is negligible. However, the pattern the opportunities followed in the 1993-2018 period is slightly different from each other. As for non-stunting, the initial level of share of non-stunted children was low at 76 percent suggesting that a quarter of the children were suffering from poor nutrition. From 1993 to 2018, the share of non-stunted children increased by 20 percentage points to 96 percent. Meanwhile, the D-Index decreased from 8 to 1 percent. As a result of this dynamic, the HOI increased from 70 percent in 1993 to 94 percent in 2018. Hence, 94 percent of the total coverage in 2018 was equally among circumstance groups (or in line with the EOP principle).

The time trend of the share of children who are non-wasted and non-underweight was similar for the whole period. The access to each opportunity was very high at the beginning of the period (96 and 91 percent for nonwasting and non-underweight respectively). The initial level of inequality was also very low at around 1 to 3 percent. Both the coverage and equality improved until 2018 and access to both opportunities became almost universal. Thus, the HOI for both opportunities was very high at 97 percent implying that almost all the opportunities were distributed in line with the EOP principle.

The story of non-overweight is different from the remaining nutritional opportunities since it followed a downward trend from 1993 to 2018. In 1993, 98 percent of the children were non-overweight and this rate was equal among all circumstance groups leading to no IOP. In 25 years, the share of non-overweight

children declined to 94 percent and the inequality remained at a negligible level (1-2 percent D-Index). This backslide in non-overweight was realized at a very small pace (around -0.2 percent annually). This signals a persistent worsening in the nutritional status of children although the current level is not very alarming. The existing low level of inequality source mainly from the differences among wealth, mother tongue, and region groups. Policymakers should focus on ensuring healthy food availability at affordable prices, regulating the food industry, raising awareness among parents on healthy nutrition, and encouraging and supporting increased physical activity for everyone. In addition, the decision-makers should closely monitor the prevalence of obesity and target the drivers of inequality.

Overall, universal access (94 percent or higher coverage rate) was achieved in 12 out of 18 opportunities analyzed in this study. This is a significant achievement for Türkiye towards achieving EOP for children. This also implies that the level of IOP in access to these opportunities is negligible. However, decision-makers should note that access is just a step towards ensuring equal chances for children to fulfill their potential. This effort should be accompanied by efforts that enhance the utilization and quality of the service. This study falls short in measuring if the child is actually utilizing the opportunity that s/he can access. For instance, in the case of computer and internet ownership at home, the child may have these services at home, but may not be fully utilizing them or may be using these for only unproductive or harmful purposes. Utilization also covers the quality of the service the child is receiving. As discussed previously for the education-related opportunities, the quality is as important as access to enjoy the potential gains from education. This also holds for basic infrastructure or health services. Hence, accessing and utilizing quality services is essential to ensure the prevalence of EOP and enjoy the potential benefits from equality of opportunity. Furthermore, it should not be forgotten that even if the share of children who cannot access these opportunities is low, the absolute number of children might be quite high considering that there are around 1,2 million children at each age in Türkiye. Hence, if access is, for instance, 98 percent, then there will be 24 thousand children at a single age with non-access. Then, if the opportunity is important for children ages 0 to 4, this number will rise to 120 thousand. In addition, these left-

behind children are very likely to suffer from multiple deprivations. Therefore, the decision-makers should not neglect these children and develop interventions that can address their vulnerabilities to ensure their enjoyment of the opportunity. Finally, being non-overweight is the only opportunity with near-universal access that follows an alarming trend. Although access is very high, it has the potential to get worse considering the increasing obesity trend at the global and national level and the high food price inflation that has been prevalent in Türkiye for the last few years.

Access to 6 out of 18 opportunities investigated in this study is not near-universal (less than 94 percent). These opportunities are computer, internet, secondary education attendance, full antenatal care, postnatal care, and immunization. The access to computer and internet is the lowest among all of them (41 and 44 percent respectively), however, the coverage of these opportunities is likely to increase over time as the price of technology decreases. Yet, this does not mean that the decision-makers should wait for this to happen. Interventions that enhance accessibility to technology and digital skills need to be developed and implemented. Moreover, the share of fully immunized children is alarmingly low (56 percent) and it is likely to be the opportunity to achieve universal access to which will be most challenging due to growing antivaccination sentiments. Therefore, decision-makers need to develop and implement comprehensive programs that focus not only on the health infrastructure but also on the social aspects of this problem. For full antenatal and postnatal care, further research is needed to establish the reasons behind the low access. For this case, enhancing the coverage of health infrastructure may not ensure full access considering that the high coverage in basic antenatal care and institutional delivery indicates no major problem regarding the availability of and accessibility to medical facilities. Although the secondary school enrollment rate was not substantially low (90 percent), this was unexpected since the mandatory schooling period covers secondary education since 2012. Tailored interventions might be needed here that address multiple potential challenges such as poverty, child labor, lack of awareness, social and cultural norms, etc.

The level of IOP is low for the majority of opportunities. The D-Index is very low (2 percent or less) for 12 out of 18 circumstances. These opportunities are the ones with near-universal access. For four opportunities (immunization, full antenatal care, postnatal care, and secondary school attendance), the D-Index is between 2 and 7 percent. For access to computer and internet, the inequality is very high at around 33-34 percent. These figures suggest that interventions specifically targeting opportunity-vulnerable groups are needed to eliminate IOP.

For the majority of opportunities, wealth was the biggest contributor to the IOP. For 5 out of 6 opportunities with a D-Index larger than 2, differential access of different wealth groups was the most important circumstance in terms of inequality in 2018. Its contribution to D-index ranged between 26 and 50 percent. Its contribution was limited only to the inequality of access to immunization.

Unlike wealth, the sex of the child was not a source of IOP for the majority of opportunities. In 2018, its contribution was significant to inequality in access to immunization and postnatal care. This finding is consistent with Salehi-Isfahani et al.(2014) who indicated that the sex of the child played a limited role in the inequality of opportunity component of the educational achievement. It was a factor in the inequality in attendance to primary education in 1993 and 1998 but its contribution diminished thereafter. However, this does not imply that the differences in access between girls and boys is not a source of inequality. Rather, the results indicate that the contribution of sex to inequality is encapsulated by other circumstances and therefore its contribution diminishes when included in the analysis with other circumstances.

The region was also a significant contributor to inequality. However, its contribution was more significant in the earlier years and its importance decreased as the access rates increased over time. The type of place of residence was an important source of inequality, especially in access to water and sanitation.

As previously discussed, coverage and HOI increased over time for the majority of opportunities. The decomposition of the change in HOI over time indicates

that most of this improvement came from scale effect signaling interventions aiming to increase overall inequality rather than targeted interventions. Yet, the equalization effect, the improvements in access of opportunity vulnerable groups without changing the overall coverage, was also an important factor in the improvements in HOI. The contribution from the composition effect was limited for most of the opportunities and periods.

While not all studies share identical circumstances and definitions for opportunities, comparing Türkiye's performance with similar countries, such as South Africa, can offer valuable insights.

A comparison with the findings of Im et al. (2012) demonstrates that Türkiye outperformed South Africa in completing primary education on time and in providing access to safe water and sanitation. However, Türkiye lagged slightly behind in primary education attendance.[106] In South Africa, the coverage and HOI for primary education attendance are around 98 percent, while Türkiye's figures are slightly lower at around 95 percent for both coverage and HOI. Notably, Türkiye exhibits relatively higher inequality (D Index) in access to primary education, at 2 percent compared to South Africa's 0.4 percent. For primary education completion, Türkiye outperforms South Africa with an on-time completion rate and HOI of 80 and 75 percent respectively compared to 56 and 50 percent in South Africa. This signals that Türkiye did a better job in keeping the children in school until they graduate. Turning to water and sanitation, Türkiye's performance is considerably better, with access rates (HOI) 94 (92) and 92 (87) percent for water and sanitation respectively. The coverage and HOI for South Africa are 63 and 48 percent for water and 67 and 55 percent for sanitation. Not surprisingly, South Africa experienced much higher distributional inequality in access, reflected in a D-Index ranging between 18 and 23 percent, compared to Türkiye's 5 percent or less.

When compared to the results in Newman (2012a) for the 2007-08 period, we found that Türkiye did significantly better than Pakistan in terms of access and

[106] South Africa analysis is from Im et al. (2012) for 2010 and it is compared to the findings of this study for 2008.

equality. The HOI values for enrolment in primary and secondary education enrolment, and completion of primary education on time were respectively 27, 10 and 20 percent lower in Pakistan compared to Türkiye. Unlike HOI, the inequality in access (D-Index) in Pakistan was not significantly worse, in fact, it was better for attendance to secondary education (9 percent in Pakistan and 12 percent in Türkiye). For primary education enrolment and completion, the D-Index was 7 and 9 percent in Pakistan respectively compared to 2 and 7 percent in Türkiye. The gap in access to health-related opportunities is even wider in favor of Türkiye. For example, the HOI for antenatal and postnatal care is 20 and 16 percent in Pakistan compared to 89 and 75 percent in Türkiye. However, the inequality in access to health opportunities is low and at comparable levels with Türkiye. A similarly wide gap exists in access to improved sanitation with a HOI of 87 percent in Türkiye compared to 46 percent in Pakistan.

Türkiye also performed generally better than Egypt in terms of access and equality[107]. As for the education component, the only comparable opportunity is completing primary education on time and Türkiye underperformed in this indicator (HOI 75 and 82 percent and D-Index 7 and 5 percent for Türkiye and Egypt respectively). However, the HOI and equality for Türkiye were better in other opportunities, including access to water, sanitation, institutionalized delivery, post and prenatal care and non-wasting.

As previously discussed, Krishnan et al. (2016)'s study provides access and inequality figures for water and sanitation in six MENA countries[108]. Accordingly, Türkiye outperformed Jordan, Morrocco, Iraq, Tunisia, and the West Bank and Gaza in access and equality in access to water. However, Türkiye and Egypt did equally well in this opportunity. For improved sanitation, the access rate and HOI values for Türkiye are remarkably higher than all six countries. Furthermore, the access is

[107] The comparision is based on the results in Velez et al. (2012) and time points are 2008 for Türkiye and 2009 for Egypt.
[108] The reference year for countries varies between 2007 and 2012 and they are compared to Türkiye's results for 2008. The study also covers two educational opportunities (school attendance and finishing 6th grade, but their definitions are not comparable to the educational opportunities in this study.

substantially more equitably distributed in Türkiye (D-Index of 6 percent in Türkiye versus D-Index values ranging between 14 and 42 percent in other countries.

From the perspective of the demographic dividend, the findings suggest that Türkiye faces no significant challenge in providing children with access to fundamental opportunities crucial for realizing the demographic dividend. These opportunities, including universal access to education and health services, are pivotal for nurturing a healthy and skilled labor force. It's essential to note that this study focuses on access and does not fully address the utilization and quality components of these services, which are integral complements to mere access. To materialize the demographic dividend, Türkiye must not only prioritize access but also emphasize effective utilization and quality of services. An enabling environment, characterized by good governance and sound economic policies, including the rule of law, efficient government, minimized corruption, appropriate labor legislation, stable macroeconomic management, and effective trade policies, is imperative. Without such measures, the potential benefits derived from the population change and age structure shift are likely to be limited. Therefore, a holistic approach that combines access, quality, and an enabling environment is necessary for maximizing the advantages of the demographic dividend in Türkiye.

9. CONCLUSION

High and increasing inequalities among individuals, communities and nations are among the most critical challenges we face today. Inequalities are generally undesirable due to moral, ethical, and developmental reasons. It is well documented that inequalities cripple the development process by hurting the productive capacity, inefficient resource allocation and impairing the economic and political institutions.

Inequality can be decomposed into two components: i) inequality due to differential effort, choice, and luck, and ii) inequality due to differences in opportunity. The former is generally desirable since it incentivizes hard work, entrepreneurship, innovation, and risk-taking. The latter one, on the other hand, is deemed unfair by the societies and it affects the development process negatively. Therefore, policymakers attempt to eliminate the causes of differences in opportunity. This phenomenon is called EOP and this principle requires that an individual's prospects should not be determined by circumstances such as race and sex that are beyond individuals' control, rather the outcomes should reflect only the degree of accountable effort exerted by the individuals. The prevalence of IOP is also critical for the demographic dividend to be realized since the expansion in the working-age population can only be translated into economic growth if the appropriate policies are not in place such as equitable and quality education and health services to all, an enabling environment, and sound macroeconomic conditions. The prerequisite for these policies is the existence of equal opportunity that gives everyone a chance to fulfill his/her potential.

The objective of this study is to analyze the IOP trends among children in Türkiye between 1993 and 2018. The study uses the HOI methodology and six TDHS (1993, 1998, 2003, 2008, 2013 and 2018) as the data source. To our knowledge, this study is the only study that investigated the inequality of opportunity trends in accessing the basic opportunities in Türkiye using the Human Opportunity Index methodology. Furthermore, it is also the study that looks at the inequality trends for the longest time period using six TDHS study conducted between 1993 and 2018

which enables to analyze the dynamics over a prolonged duration and see the impact of policy interventions on the inequality in these 25 years.

The study investigates the IOP in access to 18 opportunities among children and the changes in this dynamic in the 25 years from 1993 and 2018. The opportunities are categorized into three groups. The first group is the basic infrastructure which includes five opportunities: safe water, improved sanitation, computer access, internet access, and birth registration. The second group is the education with the following four opportunities: starting primary education on time, attending primary education, completing primary education, and attending secondary school. The last group includes health and nutrition related opportunities. These are basic and full antenatal care, institutional skilled delivery, postnatal visit, immunization, non-stunting, non-wasting, non-underweight, and non-overweight. All these opportunities are derived from the Sustainable Development Goals (SDGs). Each of them can either directly or indirectly be inferred from SDGs and SDG targets or they are already defined as an indicator to monitor the progress in the SDGs framework. Seven circumstances were identified for the study. These are the sex of the child, household size, mother tongue, parental education, wealth, region, and type of place of residence.

The main findings of the study are:

- Universal access (94 percent or higher coverage rate) was achieved in 12 out of 18 opportunities analyzed in this study. This is a significant achievement for Türkiye towards achieving EOP for children. Naturally, the level of inequality is also low for these 12 opportunities.
- Access to 6 out of 18 opportunities investigated in this study is not near universal. These opportunities are computer, internet, secondary education attendance, full antenatal care, postnatal care, and immunization. The access to computer and internet is the lowest among all of them (41 and 44 percent respectively).
- The level of IOP is low for the majority of opportunities. The D-Index is very low (2 percent or less) for 12 out of 18 circumstances. These opportunities are the ones with near-universal access. For four

opportunities (immunization, full antenatal care, postnatal care, and secondary school attendance), the D-Index is between 2 and 7 percent. For access to computer and internet, the inequality is very high at around 33-34 percent.

- For the majority of opportunities, wealth was the biggest contributor to the IOP. Region and type of place of residence were also important contributors to inequality. Unexpectedly, the sex of the child was not a source of inequality for the majority of opportunities.
- The decomposition of the change in HOI over time indicated that most of this improvement in HOI came from scale effect signaling interventions aiming to increase overall inequality rather than targeted interventions. Yet, the equalization effect, the improvements in access of opportunity vulnerable groups without changing the overall coverage, was also an important factor in the improvements in HOI. The contribution from the composition effect was limited.
- For the opportunities with high coverage and low inequality, the policymakers should note that access is just a step towards ensuring equal chances for children to fulfill their potential. This effort should be accompanied by efforts that enhance the utilization and quality of the service. Furthermore, it should not be forgotten that even if the share of children who cannot access these opportunities is low, the absolute number of children might be quite high considering the high number of children in each age group. Therefore, specific interventions addressing the multiple vulnerabilities of these "left behind" children are needed.
- For opportunities with lower coverage, the development and implementation of comprehensive interventions that simultaneously address the coverage gaps and inequality of access to these opportunities are needed. These interventions should not focus only on monetary investments but also consider the social and psychological challenges such as antivaccine sentiments in the case of vaccination.

- From the perspective of the demographic dividend, the findings suggest that Türkiye faces no significant challenge in providing children with access to fundamental opportunities crucial for realizing the demographic dividend. However, the theoretical and empirical evidence indicate that mere access is necessary but not sufficient for the demographic dividend. Therefore, a holistic approach that combines access, quality, and an enabling environment is necessary for maximizing the advantages of the demographic dividend in Türkiye.

Examining the findings of this study reveals important insights for future research. The study, however, falls short in incorporating the utilization and quality aspects of the inequality of opportunity in access to basic opportunities. To address this limitation, future studies could focus on the quality aspects of education inequality. For instance, investigating the inequality in acquiring minimum levels of mathematics, science, and reading skills (opportunity) using PISA and TIMMS data can highlight existing disparities in education quality. Moreover, researchers may explore multiple dimensions of deprivation by examining the inequality of access to several basic opportunities simultaneously, bundling them into a single opportunity. This comprehensive approach can offer a more nuanced understanding of inequalities among different groups. Another avenue for future research involves delving into the regional dimension of inequality of opportunity. Conducting a similar analysis at the regional level can unveil trends specific to different regions, facilitating comparisons of dynamics between them. This regional focus is likely to yield insightful and actionable results, shedding light on the local opportunity disparities.

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APPENDICES

Appendix A: Comparison of Six TDHS

TDHS	1993	1998	2003	2008	2013	2018
Sampling Design	Weighted, multistage, stratified, cluster sampling (WMSC sampling)	(WMSC sampling)	(WMSC sampling)	(WMSC sampling)	(WMSC sampling)	(WMSC sampling)
Sample Frame	Urban: 10,000+ Rural: remaining districts	Urban: 10,000+ Rural: remaining districts	Urban: 10,000+ Rural: remaining districts	Urban: 10,000+ Rural: remaining districts	Urban: 10,000+ Rural: remaining districts	Urban: 10,000+ Rural: remaining districts
Representative Domains	Turkey Urban/Rural 5 Regions - West - South - Central - North - East	Turkey Urban/rural 5 Regions	Turkey Urban/rural 5 Regions 12 NUTS 1 Regions - İstanbul - West Marmara - Aegean - East Marmara - West Anatolia - Mediterranean - Central Anatolia - West Black Sea - East Black Sea - Northeast Anatolia	Turkey Urban/rural 5 Regions 12 NUTS 1 Regions 7 metropolitans (1million+) - İstanbul - Ankara - İzmir - Bursa - Adana - Konya - Gaziantep	Turkey Urban/rural 5 Regions 12 NUTS 1 Regions 7 metropolitans (1million+)	Turkey Urban/rural 5 Regions 12 NUTS 1 Regions

TDHS	1993	1998	2003	2008	2013	2018
			- Central East Anatolia - Southeast Anatolia			
Sample Implementation	– Completed HH: 8,619 – HRR: 96.8% – Completed Women: 6,519 – IRR: 95,0%	– Completed HH: 8,059 – HRR: 93.8% – Completed all women: 8,578 • Ever.marr. W:6,512 – IRR all women: 90,6% • IRR EM women: 92,7% – Husbands C: 1,971 • IRR Husbands: 65%	– Completed HH: 10,836 – HRR: 92.9% – Completed Women: 8,075 – IRR: 95,6%	– Completed HH: 10,525 – HRR: 88.4% – Completed Women: 7,405 – IRR: 92,5%	– Completed HH: 11,794 – HRR: 93,3% – Completed Women: 9,745 – IRR:89,9%	– Completed HH: 11,056 – HRR: 79,2% – Completed Women: 7,346 – IRR:81,1%
Stratification	28 Strata 14 (Sub-regions)*2 (urban/rural) - 3 sub-regions in West - 2 sub-regions in South - 3 sub-regions in Center - 2 sub-regions in North - 4 sub-regions in East	28 Strata 14 (Sub-regions)*2 (urban/rural) - 3 sub-regions in West - 2 sub-regions in South - 3 sub-regions in Center - 2 sub-regions in North - 4 sub-regions in East	40 Strata - 30 (15 divisions *urban/rural) - 2 İstanbul (slum/non-slum) - 8 (4 metropolitans *urban/rural)	36 Strata - 30 (15 divisions*urban/rural) - 6 (metropolitans except İstanbul)	36 Strata - 30 (15 divisions*urban/rural) - 6 (metropolitans except İstanbul)	15 Strata (see HUIPS (2019) Table A.' for details)

TDHS	1993	1998	2003	2008	2013	2018
Questionnaires	2 questionnaires - Household - Ever-married women (15-49)	4 questionnaires - Household - Ever-married women (15-49) - Never-married women - Husbands	2 questionnaires - Household - Ever-married women (15-49)	2 questionnaires - Household - Ever-married women (15-49)	2 questionnaires - Household - Ever-married women (15-49)	2 questionnaires - Household - All women (15-49)

Appendix B: The Review of Studies that Employ HOI Methodology

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
Barros et al. (2009)	19 LAC Countries	• Cross Country HOI • Decomposition over circumstances • Decomposition over time	Housing 1. Adequate access to water 2. Access to electricity 3. Adequate access to sanitation Education 4. School attendance rate 5. Completing sixth grade on time	1. Gender of the child 2. Urban/rural 3. Number of years of schooling of the HH head 4. Family per capita family income 5. Single/two parent household 6. Number of siblings
World Bank (2010)	Uruguay	• HOI computation • Regional HOI • Decomposition over circumstances • Decomposition over time	Education 1. Attendance primary: 6-12 years 2. Attendance secondary: 10-14 years 3. Attendance secondary: 12-17 years 4. On time completion of 6th grade 5. On time completion of 7th grade 6. On time completion of 8th grade 7. On time completion of 9th grade 8. Children speaking English: 14-18 years 9. Children writing English: 14-18 years Health 10. Preventive dental care 11. Have access to health services Housing and infrastructure 12. Access to sanitation: Connection to sewage or septic tank 13. Access to electricity 14. Water in the dwelling 15. Access to sanitation 2: connection to sewage only 16. Dwelling constructed in a non-flood-risk area 17. Dwelling constructed in a regularized lot Access to communication technologies 18. Access to computer (6-16)	1. Gender 2. Area of residence (urban/rural) 3. Ethnicity 4. Both parents in the household 5. Per capita income 6. Number of children younger than 16 7. Number of years of schooling of the HH head

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
			19. Access to internet (6-16) 20. Cell phone in the household 21. Telephone in the household	
Vega et al. (2012)	19 LAC Countries	• Cross Country HOI • Regional HOI • Decomposition over circumstances • Decomposition over time	Housing 1. Adequate access to water 2. Access to electricity 3. Adequate access to sanitation Education 4. School attendance rate 5. Completing sixth grade on time	1. Parents education 2. Family per capita income 3. Number of siblings 4. The Presence of both parents 5. Urban/rural 6. Gender of the child 7. Gender of HH head
Newman (2012a) and (2012b)	Pakistan	• HOI computation • Regional HOI • Decomposition over circumstances	Education 1. Enrollment of children 6-10 2. Enrollment of children 11-15 3. Primary completion among children 15-19 4. Secondary completion among children 20-24 Health 5. Did not have diarrhea in the last 30 days 6. Ever received immunization 7. Received full immunization according to self-report or health card 8. Received full immunization according to health card 9. Received adequate prenatal care: at least 3 prenatal care visits 10. Received any postnatal care within the 6 weeks after birth 11. Attended by some traditional or formal birth attendant 12. Attended by formal birth attendant 13. Institutional birth Infrastructure 14. Having improved sanitation 15. Having improved water	1. Gender 2. Urban/rural 3. Household size 4. Real per capita consumption 5. Education level of HH head 6. Gender of HH head 7. 3 dummy for regions

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
			16. Having electricity connection 17. Having gas connection 18. Having telephone	
Im et al. (2012)	South Africa	• HOI Computation • Decomposition over circumstances • Decomposition over time	1. School attendance (ages 6-11) 2. School attendance (ages 12-15) 3. Finish primary school on time (ages 13-15) 4. Adequate infrastructure in school 5. Adequate teachers in school 6. ECD exposure (ages 0-4) 7. Have health insurance 8. No overcrowding 9. Access to safe water on site 10. Access to improved sanitation 11. Access to electricity 12. Access to telecommunications 13. Safe location	1. Gender 2. Ethnicity 3. Presence of the spouse of the HH head in the household, 4. Total number of children ages 0–16 in the HH 5. Presence of the father in the HH 6. Presence of the mother in the HH 7. Mother Alive 8. Father Alive 9. Education of HH head, 10. Age of HH head 11. Gender of HH head 12. Location (urban/rural)
Vélez et al (2012)	Egypt	• HOI computation • Regional HOI • Multidimensional HOI computation • Decomposition over time	Education 1. Complete primary on time 2. Complete secondary on time 3. School attendance, 9-15 Basic Housing Services 4. Access to clean water 5. Access to adequate sanitation 6. Lightning energy source 7. Non-overcrowding 8. Access to telephone Early Childhood Development 9. Assisted birth delivery 10. Access to institutionally assisted birth delivery 11. Postnatal care 12. Prenatal care 13. Immunization vaccines	1. Gender 2. Number of children in the house 3. Presence of parents 4. Number of people over age 70 or disabled in the house 5. Education level of father and mother 6. Income per capita 7. Location (urban/rural) 8. Region (4 regions)

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
			Nutrition and Hunger 14. Non-wasting 15. Non-stunting 16. Non-underweight	
Sun (2013)	Bangladesh, Bhutan, Indonesia, Pakistan, the Philippines, Sri Lanka and Viet Nam	• Cross country HOI • Decomposition over circumstances	Basic Education 1. Primary attendance 2. Secondary attendance Basic Housing Services 3. Access to safe water 4. Access to electricity 5. Access to sanitation	1. Gender 2. Location (urban/rural) 3. Education level of household head 4. Per capita HH expenditure 5. Age of HH Head 6. Gender of HH head 7. Household size
(Singh, 2012a)	India	• Cross country HOI • Regional HOI • Decomposition over time	1. Completion fifth standard on time	1. Caste of the household head 2. Religion 3. Gender of the child 4. Place of residence 5. Wealth 6. Average parental education 7. Number of siblings
Aran and Ersado (2013)	Egypt	• HOI computation • Decomposition overtime • Decomposition over circumstances	Healthcare Utilization 1. Child received all immunization 2. Assisted delivery 3. Birth facility 4. Antenatal care 5. Postnatal check Housing and Access to Basic Infrastructure 6. Access to improved drinking water 7. Having non-shared toilet 8. Electricity in the HH (0-4) 9. Identity card Education 10. Primary attendance 11. Secondary attendance	1. Location (urban/rural 2. Region 3. Mother's education 4. Father's education 5. Number of children at home: 6. Household wealth 7. Household income

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
			12. Completion of 6th grade on time 13. Completion of 9th grade on time Nutrition and Micronutrient Intake 14. Stunting (0-4) 15. Wasting (0-4) 16. Underweight (0-4) 17. Access to iodized salt 18. Iron tablets in pregnancy.	
Jemali & Amara (2015)	Tunisia	• HOI computation • Regional HOI • Decomposition over circumstances	Basic Education 1. Primary school attendance (6-11) 2. Secondary school attendance (12-17) Basic Infrastructure 3. Access to electricity 4. Access to safe water 5. Access to sanitation	1. Gender 2. Residence area 3. Education of HH head 4. Per capita expenditure 5. Age of HH head 6. Gender of HH head 7. Household size
Dabalen et al. (2015)	20 Sub-Saharan African Countries	• Cross Country HOI • Decomposition over circumstances • Decomposition over time	Basic Education 1. Access to primary education 2. Access to secondary education 3. Starting primary on time 4. Finishing primary on time Basic Infrastructure 5. Access to electricity, 0-16 6. Access to safe water, 0-16 7. Access to sanitation, 0-16 Health 8. Full immunization 9. Not being stunted	1. Child gender 2. Location 3. Wealth 4. Household composition 5. Head education 6. Head age 7. Head gender
Hlasny (2015)	Algeria, Comoros, Djibouti, Egypt, Iraq, Jordan,	• Cross-country HOI • Decomposition over circumstances	Health 1. Prenatal care: Health check-up performed by doctor, trained nurses or midwifes, 0-2 2. Prenatal Visits 4+: 4 or more visits to qualified physician or health center, 0-2	1. Wealth 2. Education level of mother 3. Education level of father or HH head 4. Urban/rural

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
	Mauritania, Morocco, Palestine, Somalia, Sudan, Syria, Tunisia, Yemen		3. Skilled delivery: Delivery in the hospital or health center 4. Full Immunization: Vaccination for all 6 preventable diseases (BCG,DPT,Polio, Measles (12-24 month) 5. Neonatal Mortality 6. Infant Mortality Nutrition 7. Stunted: For children 0-4 8. Wasted: For children 0-4 9. Underweight: For children 0-4 10. Iodized salt: For children 0-4 Early Childhood Development 11. Preschool attendance: For children 3-4 12. Early childhood education: For children 5-6 13. Developmental activities: Engagement of parents in 4+ act.,3-4 (reading, playing etc) 14. Violent Discipline: Abusing 2-5 year old child verbally or physically 15. Child labor: Working outside the home for 5 years olds (paid or unpaid)	5. Regions 6. Gender of the child 7. Gender of HH head
Pons Duran et al. (2016)	29 Sub-Saharan African Countries	• Cross Country HOI • Decomposition over circumstances	Women of reproductive age (15-49 years old) 1. Not having anaemia 2. Having the recommended BMI 3. Met need for family planning 4. Knowledge of a place where to get an HIV test Pregnant women 5. Four antenatal care visits 6. Delivery attended by skilled personnel 7. Postnatal checkup 8. Maternity care package 9. Malaria prophylaxis during pregnancy 10. HIV test offered during pregnancy	1. Age 2. Marital status 3. Number of children 4. Sex of the household head 5. Religion 6. Educational level 7. Area (urban/rural) 8. Wealth index (quintiles)

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
			11. Infant checkup within two months after delivery 12. Six months of exclusive breastfeeding Older adolescent girls (15-19 years old) 13. Met need for family planning 14. Having never been pregnant 15. Currently attending school	
Krishnan (2016)	Arab Republic of Egypt, Iraq, Jordan, Morocco, Tunisia, and the West Bank and Gaza	• Cross Country HOI • Decomposition over circumstances • Decomposition over time	Education 1. Attending school for children ages 10–14 years 2. Completing primary-basic education on time Health 3. No wasting for children 0-4 years 4. No stunting for children 0-4 years 5. No underweight for children 0-4 6. Assisted birth: Doctor, midwife, or nurse assisted during birth (children ages 0–4) 7. Any prenatal care Basic Housing Services 8. Access to water 9. Access to sanitation 10. Waste correctly disposed 11. Access to electricity 12. Access to reliable electricity 13. Access to sufficient water 14. Frequent interruptions of water supply	1. Gender of the child 2. Presence of children in the household (0-15) 3. Presence of elderly (65+) 4. Single parent household 5. Age of HH head 6. Education of HH head 7. Public worker (if HH head works in the public sector) 8. Rural/urban 9. Region 10. Consumption quintile
Sanoussi (2017)	Togo	• HOI computation • Decomposition over circumstances • Decomposition over time	1. Birth in a public or private health center 2. Access to immunization 3. Access to prenatal care 4. Access to prenatal care by qualified staff 5. Having at least four antenatal visits 6. Adequate care	1. Parental education 2. Parental occupation 3. Wealth 4. Gender of the household head 5. Gender of the child 6. Number of children in hh 7. Region 8. Residence

Author	Countries Analyzed	Type of Analysis	Basic Opportunities	Circumstances
Prieto et al. (2018)	Hillsborough County, FL, USA	• HOI computation • Decomposition over circumstances	1. Access to magnet schools 2. Access to high quality magnet schools	1. Race 2. Gender 3. Disability status 4. Mother language 5. Having sibling at school 6. Parental occupation, 7. Qualification for free or reduced price meal 8. Distance from selected school 9. Urban/rural 10. ESEA compliant accountability factor

Appendix C.: Analysis Results

Results of Human Opportunity Index and Inequality Contributors

2018

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc.	C.Peduc.	Att. Seduc.
HOI	0.94	0.98	0.97	0.93	0.97	0.52	0.96	0.81	0.98	0.65	0.93	0.96	0.27	0.30	0.93	0.97	0.98	0.85
D-index	0.01	0.00	0.01	0.01	0.01	0.07	0.01	0.06	0.01	0.05	0.01	0.02	0.34	0.33	0.02	0.01	0.01	0.05
Penalty	0.01	0.00	0.01	0.01	0.01	0.04	0.01	0.05	0.01	0.03	0.01	0.01	0.14	0.14	0.02	0.01	0.01	0.05
Coverage	0.96	0.99	0.97	0.94	0.98	0.56	0.97	0.86	0.99	0.68	0.95	0.98	0.41	0.44	0.95	0.97	0.99	0.90
Contribution of Circumstances																		
Sex	0.37	0.65	17.75	1.89	1.81	35.80	0.39	0.66	1.54	16.32	0.24	0.32	0.78	0.10	6.80	0.54	1.42	2.09
Moth. tongue	10.81	36.87	1.43	23.25	34.14	1.53	8.92	12.48	17.20	4.90	2.74	6.08	8.49	10.19	17.11	21.24	17.36	21.69
Paren.educ.	17.70	4.14	5.95	4.59	12.73	2.23	11.16	21.40	12.49	11.40	3.17	6.29	12.57	9.58	10.08	13.40	4.44	13.96
HH Size	11.72	8.64	9.60	16.65	17.52	13.55	25.48	21.08	11.20	4.66	4.49	6.27	8.03	7.85	5.44	8.72	22.06	11.21
Wealth	46.13	15.05	27.58	31.39	21.78	7.74	34.87	26.77	35.02	40.96	32.05	43.65	50.40	47.59	24.82	37.17	20.79	35.40
Region	10.00	30.38	36.80	16.83	10.07	37.07	12.14	11.73	13.56	12.33	18.04	11.56	10.53	14.06	9.71	6.74	29.65	12.45
Urban/Rural	3.27	4.28	0.90	5.40	1.95	2.08	7.06	5.88	8.99	9.42	39.27	25.83	9.19	10.62	26.04	12.18	4.28	3.19

2013

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
HOI	0.91	0.98	0.97	0.92	0.99	0.76	0.96	0.80	0.96	0.66	0.96	0.92	0.39	0.23	0.93	0.97	0.81	0.80
D-index	0.02	0.00	0.01	0.01	0.00	0.04	0.01	0.07	0.02	0.09	0.01	0.04	0.29	0.38	0.02	0.01	0.06	0.06
Penalty	0.02	0.00	0.01	0.01	0.00	0.03	0.01	0.06	0.02	0.06	0.01	0.03	0.16	0.14	0.02	0.01	0.05	0.05
Coverage	0.93	0.99	0.98	0.94	0.99	0.79	0.97	0.86	0.97	0.72	0.97	0.95	0.55	0.37	0.95	0.97	0.86	0.85
Contribution of Circumstances																		
Sex	2.29	24.16	6.79	9.42	9.20	1.96	2.69	0.26	0.92	0.05	1.35	0.24	0.17	0.63	20.79	4.77	2.21	0.69
Moth. tongue	8.45	3.05	13.13	12.14	13.49	12.82	11.39	11.41	18.59	11.72	6.67	10.22	9.03	8.14	10.29	17.80	21.23	17.39
Paren.educ.	11.20	14.74	8.40	15.84	7.50	3.33	10.10	15.34	10.41	6.09	6.50	7.79	11.60	14.26	4.63	4.40	7.42	14.00
HH Size	11.97	19.04	12.31	12.34	33.44	36.91	11.13	13.27	16.75	7.26	4.63	6.44	7.17	7.49	35.47	27.91	15.88	16.79
Wealth	40.08	23.16	27.69	29.82	16.49	24.21	32.42	31.64	19.89	15.40	24.32	37.91	49.59	51.80	12.55	22.10	27.95	29.00
Region	14.68	8.42	21.24	12.83	12.15	8.19	18.82	16.88	20.27	53.20	14.27	9.75	11.97	9.09	13.66	18.96	16.57	10.70
Urban/Rural	11.33	7.42	10.43	7.60	7.73	12.57	13.43	11.19	13.18	6.28	42.25	27.65	10.47	8.59	2.61	4.06	8.75	11.43

2008

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
HOI	0.87	0.99	0.96	0.93	0.94	0.80	0.89	0.57	0.85	0.75	0.92	0.87	0.22	0.14	0.85	0.94	0.75	0.65
D-index	0.04	0.00	0.01	0.02	0.02	0.05	0.04	0.15	0.06	0.07	0.02	0.06	0.43	0.51	0.04	0.02	0.07	0.12
Penalty	0.03	0.00	0.01	0.01	0.02	0.04	0.04	0.10	0.05	0.06	0.01	0.05	0.17	0.14	0.04	0.02	0.06	0.09
Coverage	0.90	0.99	0.97	0.94	0.96	0.84	0.93	0.67	0.91	0.81	0.94	0.92	0.39	0.28	0.89	0.96	0.80	0.74
Contribution of Circumstances																		
Sex	1.06	42.37	4.60	1.40	0.08	4.28	1.29	0.69	0.58	0.04	0.34	0.06	0.43	0.05	3.02	1.53	0.44	7.76
Moth. tongue	15.33	15.86	12.33	7.60	25.44	13.36	13.67	11.06	24.94	14.88	10.29	11.37	5.56	4.94	13.87	18.65	22.75	9.23
Paren.educ.	9.20	2.76	15.64	12.13	6.47	7.39	14.83	16.66	10.29	14.11	4.56	6.90	11.64	12.98	8.13	7.10	4.34	17.56
HH Size	8.54	2.99	16.69	12.03	14.08	11.52	11.53	17.26	10.41	11.10	6.33	7.31	7.05	6.41	13.88	14.45	16.19	14.07
Wealth	34.76	13.43	24.44	38.31	21.87	26.79	31.55	31.58	23.46	19.39	22.31	31.37	57.12	57.67	32.53	35.37	34.40	36.74
Region	20.04	21.24	17.52	19.46	23.06	26.73	17.51	13.88	20.23	33.02	42.96	13.82	9.07	9.45	21.12	16.96	15.90	6.25
Urban/Rural	11.07	1.35	8.78	9.06	9.01	9.93	9.62	8.87	10.09	7.45	13.22	29.17	9.13	8.50	7.44	5.94	5.99	8.39

2003

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
HOI	0.85	0.99	0.95	0.94	0.81	0.53	0.69	0.31	0.72	0.00	0.96	0.76	0.04	0.01	0.74	0.90	0.58	0.58
D-index	0.04	0.00	0.01	0.01	0.05	0.12	0.12	0.28	0.10	0.00	0.01	0.10	0.65	0.75	0.06	0.03	0.12	0.16
Penalty	0.04	0.00	0.01	0.01	0.04	0.08	0.09	0.12	0.08	0.00	0.01	0.08	0.07	0.03	0.05	0.02	0.08	0.11
Coverage	0.89	0.99	0.97	0.95	0.85	0.61	0.79	0.44	0.81	0.00	0.97	0.84	0.11	0.05	0.79	0.92	0.66	0.70
Contribution of Circumstances																		
Sex	2.68	20.51	5.59	0.16	1.55	5.16	0.50	1.34	1.56	0.00	1.77	0.05	1.04	0.34	1.90	3.39	0.40	6.32
Moth. tongue	11.57	3.89	12.90	10.39	11.96	14.51	11.92	8.43	18.88	0.00	13.64	10.61	3.38	3.37	13.04	18.33	20.02	7.89
Paren.educ.	11.02	4.73	9.00	11.59	21.10	7.00	13.73	14.58	10.03	0.00	11.30	8.24	21.80	25.50	10.07	8.01	11.76	18.33
HH Size	19.21	13.64	14.86	14.41	16.64	17.15	18.84	23.41	16.56	0.00	15.02	9.39	10.77	10.51	25.37	26.17	22.90	13.64
Wealth	25.95	50.79	34.41	29.78	27.75	23.78	26.62	27.16	23.37	0.00	19.64	23.74	47.20	45.73	19.33	20.83	22.92	31.12
Region	18.27	5.52	15.02	15.97	14.94	10.92	13.51	12.42	18.01	0.00	12.13	17.68	7.07	7.44	24.10	18.30	16.00	5.07
Urban/Rural	11.30	0.92	8.22	17.69	6.06	21.49	14.88	12.66	11.59	0.00	26.50	30.30	8.75	7.11	6.20	4.96	6.00	17.62

1998

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
HOI	0.76	0.96	0.92	0.98	0.71	0.42	0.56	0.25	0.63	0.00	0.91	0.75	0.01	0.00	0.66	0.75	0.33	0.31
D-index	0.06	0.01	0.02	0.01	0.09	0.16	0.16	0.30	0.14	0.00	0.02	0.10	0.68	0.00	0.14	0.09	0.25	0.26
Penalty	0.05	0.01	0.02	0.01	0.07	0.08	0.11	0.11	0.10	0.00	0.02	0.08	0.03	0.00	0.10	0.07	0.11	0.11
Coverage	0.81	0.97	0.94	0.98	0.77	0.50	0.67	0.36	0.73	0.00	0.93	0.83	0.04	0.00	0.76	0.82	0.44	0.41
Contribution of Circumstances																		
Sex	2.00	5.87	0.16	35.74	0.81	0.48	0.26	1.21	1.44	0.00	0.58	0.02	1.02	0.00	0.11	10.49	3.44	4.10
Moth. tongue	16.48	9.31	18.46	6.04	18.91	18.83	14.31	10.80	23.38	0.00	17.39	4.56	4.10	0.00	19.29	16.27	10.46	8.97
Paren.educ.	10.60	4.55	7.52	11.54	8.69	5.79	10.05	12.63	8.10	0.00	4.78	5.75	22.06	0.00	8.47	7.56	12.71	13.79
HH Size	9.08	4.08	8.75	11.81	17.57	12.27	15.21	21.01	16.43	0.00	21.67	8.30	9.17	0.00	14.00	17.06	15.34	16.16
Wealth	29.38	23.45	27.94	10.50	25.89	28.34	30.93	28.87	22.62	0.00	16.51	39.20	44.06	0.00	28.13	26.83	36.31	35.63
Region	21.69	36.86	28.23	19.91	18.01	25.86	16.30	15.51	18.73	0.00	28.42	10.85	8.24	0.00	22.68	12.99	8.62	7.24
Urban/Rural	10.78	15.88	8.94	4.45	10.12	8.43	12.95	9.96	9.30	0.00	10.65	31.32	11.35	0.00	7.32	8.79	13.13	14.11

1993

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
HOI	0.70	0.95	0.88	0.98	0.64	0.56	0.51	0.20	0.47	0.00	0.98	0.72	0.00	0.00	0.64	0.75	0.29	0.28
D-index	0.08	0.01	0.03	0.00	0.11	0.14	0.19	0.33	0.21	0.00	0.01	0.11	0.78	0.00	0.14	0.07	0.26	0.26
Penalty	0.06	0.01	0.03	0.00	0.08	0.09	0.11	0.10	0.12	0.00	0.01	0.09	0.01	0.00	0.10	0.06	0.10	0.10
Coverage	0.76	0.96	0.91	0.98	0.72	0.65	0.62	0.29	0.59	0.00	0.99	0.81	0.02	0.00	0.74	0.81	0.39	0.37
Contribution of Circumstances																		
Sex	1.72	2.14	1.95	19.66	0.97	1.37	0.40	0.42	0.21	0.00	0.70	0.26	1.33	0.00	2.93	16.13	1.57	2.46
Moth. tongue	13.70	22.57	19.42	13.73	17.46	20.21	12.14	8.74	16.10	0.00	20.62	6.15	3.19	0.00	21.55	14.10	7.47	5.96
Paren.educ.	8.79	8.00	7.52	11.85	8.48	8.94	7.94	13.27	7.51	0.00	1.63	5.74	19.98	0.00	5.12	8.34	11.16	11.93
HH Size	12.39	6.75	13.82	4.59	11.40	10.73	16.96	16.02	13.44	0.00	4.38	7.30	13.06	0.00	14.79	10.75	10.96	14.76
Wealth	33.22	30.20	25.46	26.94	30.43	20.95	26.27	30.25	28.85	0.00	25.14	40.55	43.03	0.00	22.71	29.65	41.05	38.31
Region	21.13	26.93	23.54	19.76	17.96	21.69	23.15	18.67	16.29	0.00	19.49	13.48	9.01	0.00	25.73	10.52	8.39	7.27
Urban/Rural	9.04	3.41	8.29	3.47	13.30	16.11	13.13	12.63	17.60	0.00	28.04	26.52	10.40	0.00	7.16	10.52	19.40	19.32

Results for Decompostion of the Change in HOI Over Time

2018-2013

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
Decomposition (p.p.)																		
Change (p.p.)	3.09	-0.11	-0.15	0.78	-1.71	-22.93	-0.44	0.71	2.39	-1.21	-2.22	4.59	-11.16	6.89	-0.52	-0.06	16.25	5.70
Composition (p.p.)	0.11	0.04	-0.05	0.05	-0.26	-2.35	-0.06	-0.05	0.26	-0.87	-0.25	-0.49	-0.40	0.03	0.03	-0.07	1.40	-0.75
Scale (p.p.)	2.59	-0.11	-0.32	0.45	-0.74	-19.97	-0.60	-0.06	1.30	-2.78	-1.95	3.00	-9.09	4.08	-0.49	-0.05	10.82	4.81
Equalization (p.p.)	0.39	-0.05	0.21	0.29	-0.71	-0.61	0.21	0.82	0.83	2.44	-0.02	2.08	-1.67	2.78	-0.06	0.06	4.03	1.64
Decomposition (%)																		
Composition (%)	3.55	-36.18	32.01	6.10	15.18	10.26	12.39	-6.58	10.96	72.26	11.40	-10.64	3.59	0.47	-5.25	114.45	8.63	-13.17
Scale (%)	83.85	93.04	209.34	57.41	43.45	87.10	134.36	-8.22	54.29	230.25	87.77	65.28	81.46	59.20	94.39	88.03	66.58	84.34
Equalization (%)	12.60	43.14	-141.35	36.50	41.37	2.64	-46.75	114.79	34.75	-202.52	0.84	45.36	14.95	40.33	10.86	-102.48	24.79	28.82

2013-2008

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
Decomposition (p.p.)																		
Change (p.p.)	4.30	-0.34	0.52	-0.39	4.87	-4.18	6.98	23.14	10.15	-8.57	3.10	4.88	16.77	9.16	7.93	2.61	6.35	14.22
Composition (p.p.)	0.07	-0.13	0.07	-0.23	-0.40	-0.47	0.18	1.08	0.48	-0.02	0.45	0.34	-1.83	-1.40	0.29	-0.27	-2.86	-1.70
Scale (p.p.)	2.52	-0.33	0.15	-0.25	3.76	-4.18	4.28	14.93	6.03	-8.25	2.78	2.40	10.10	5.41	5.49	1.98	7.09	10.80
Equalization (p.p.)	1.72	0.11	0.31	0.09	1.51	0.48	2.53	7.13	3.64	-0.31	-0.13	2.14	8.51	5.15	2.14	0.90	2.11	5.13
Decomposition (%)																		
Composition (%)	1.60	38.50	12.80	59.10	-8.20	11.30	2.60	4.70	4.70	0.20	14.60	6.90	-10.90	-15.30	3.70	-10.30	-45.10	-12.00
Scale (%)	58.50	94.50	28.10	63.70	77.20	100.10	61.20	64.50	59.40	96.20	89.60	49.20	60.20	59.10	69.30	76.00	111.80	75.90
Equalization (%)	39.90	-33.00	59.10	-22.80	31.00	-11.40	36.20	30.80	0.00	3.60	-4.20	43.90	50.70	56.20	27.00	34.30	33.30	36.00

2008-2003

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
Decomposition (p.p.)																		
Change (p.p.)	1.52	-0.37	0.85	-1.61	13.09	27.35	19.69	25.52	13.10	0.00	-3.30	10.34	17.62	12.60	11.49	4.40	16.44	7.10
Composition (p.p.)	-0.17	0.00	-0.17	-0.06	0.83	0.09	3.01	3.60	-2.01	0.00	-0.01	-0.86	0.13	0.02	-0.47	-0.79	-0.96	0.36
Scale (p.p.)	1.14	-0.17	0.89	-0.78	9.23	19.98	10.44	14.16	9.82	0.00	-2.98	7.23	9.54	5.82	9.76	3.93	12.96	3.54
Equalization (p.p.)	0.55	-0.20	0.13	-0.78	3.03	7.28	6.24	7.76	5.28	0.00	-0.32	3.97	7.95	6.76	2.19	1.26	4.44	3.20
Decomposition (%)																		
Composition (%)	-10.94	0.08	-19.46	3.43	6.34	0.32	15.27	14.10	-15.32	0.00	0.24	-8.33	0.76	0.14	-4.08	-17.93	-5.84	5.09
Scale (%)	74.80	45.60	104.56	48.50	70.54	73.07	53.04	55.48	74.99	0.00	90.23	69.91	54.13	46.16	84.98	89.30	78.84	49.83
Equalization (%)	36.13	54.32	14.91	48.08	23.13	26.62	31.69	30.42	40.33	0.00	9.54	38.42	45.11	53.70	19.11	28.62	27.00	45.09

2003-1998

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
Decomposition (p.p.)																		
Change (p.p.)	9.18	2.80	3.94	-3.46	10.19	10.94	12.85	6.15	9.15	0.00	4.56	1.41	2.65	0.00	7.96	14.69	25.34	27.61
Composition (p.p.)	1.78	0.11	0.60	-0.29	3.32	4.72	3.97	2.05	5.81	0.00	1.16	2.74	0.28	0.00	7.63	4.72	5.27	6.80
Scale (p.p.)	6.08	2.29	2.35	-3.16	5.14	6.78	6.97	4.02	2.88	0.00	2.66	-0.51	2.60	0.00	-2.29	5.98	13.11	16.33
Equalization (p.p.)	1.33	0.40	0.99	-0.02	1.73	-0.56	1.91	0.08	0.46	0.00	0.73	-0.82	-0.23	0.00	2.62	3.99	6.95	4.48
Decomposition (%)																		
Composition (%)	19.35	3.99	15.34	8.34	32.58	43.11	30.88	33.35	63.49	0.00	25.46	193.72	10.49	0.00	95.87	32.11	20.80	24.62
Scale (%)	66.18	81.83	59.60	91.17	50.41	62.00	54.25	65.39	31.44	0.00	58.44	-36.06	98.16	0.00	-28.83	40.73	51.76	59.14
Equalization (%)	14.47	14.18	25.06	0.49	17.01	-5.11	14.87	1.26	5.07	0.00	16.10	-57.66	-8.65	0.00	32.96	27.16	27.44	16.24

1998-1993

	Non-Stu.	Non-Was.	Non-Uwei.	Non-Owei.	B.Reg.	Immu.	B.ANC	F.ANC	Ins.Del.	PNC	Water	Imp.San.	Comp.	Intern.	S.Peduc	Att.Peduc	C.Peduc	Att. Seduc
Decomposition (p.p.)																		
Change (p.p.)	6.32	1.18	3.21	0.29	7.30	-13.70	5.93	5.51	16.34	0.00	-6.84	2.82	1.09	0.00	1.72	0.44	4.89	3.25
Composition (p.p.)	0.18	-0.37	0.02	0.01	-0.64	-0.75	1.65	1.36	-0.45	0.00	-0.30	0.82	0.06	0.00	-3.11	-1.53	-1.63	-0.73
Scale (p.p.)	4.27	1.02	2.16	0.37	5.24	-13.06	3.11	3.60	11.33	0.00	-5.67	1.27	0.43	0.00	3.10	2.31	4.60	2.86
Equalization (p.p.)	1.87	0.53	1.03	-0.09	2.70	0.11	1.17	0.55	5.46	0.00	-0.87	0.72	0.61	0.00	1.74	-0.33	1.92	1.12
Decomposition (%)																		
Composition (%)	2.84	-31.46	0.62	2.31	-8.73	5.48	27.85	24.66	-2.76	0.00	4.35	29.23	5.42	0.00	-180.83	-346.66	-33.25	-22.34
Scale (%)	67.55	86.77	67.36	127.07	71.76	95.33	52.43	65.38	69.36	0.00	82.89	45.10	39.05	0.00	179.76	522.23	94.07	87.80
Equalization (%)	29.61	44.69	32.02	-29.37	36.97	-0.82	19.72	9.96	33.40	0.00	12.76	25.67	55.53	0.00	101.08	-75.57	39.18	34.53