

Inequality of Health Opportunity Among Children Aged under 5 Years in Togo

Yacobou Sanoussi

Research Paper 414

AFRICAN ECONOMIC RESEARCH CONSORTIUM
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

Inequality of Health Opportunity among Children Aged under 5 Years in Togo

By

Yacobou Sanoussi
Faculty of Economics and Management
(FASEG)
University of Lome

AERC Research Paper 414
African Economic Research Consortium, Nairobi
January 2021

THIS RESEARCH STUDY was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are, however, those of the author and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 - City Square
Nairobi 00200, Kenya

ISBN 978-9966-61-109-3

© 2021, African Economic Research Consortium.

Contents

List of tables

List of figures

Abstract

1.	Context and Justification	1
2.	Problem Statement and Research Questions	3
3.	General Objectives and Key Assumptions	6
4.	Theoretical and Conceptual Framework for the Inequality of Health Opportunity	7
5.	Empirical Evidence Approaches of Measuring the Inequality of Opportunities	10
6.	Methodology	13
7	Empirical Estimation Technique	22
8	Results and Intepretations	23
9.	Conclusion and Policy Implications	32
	Notes	33
	References	34
	Appendix	37

List of tables

1.	Changes in health status (stunting) in Togo from 1998 to 2013	4
2.	Description of the variables of interest in databases	15
3.	Share of the population, the average of the standardized height and relative average according to the groups of opportunity	27
4.	Average of standardized height and total health inequality in 1998 and 2013	28
5.	Decomposition of total inequality in inequality of opportunity and the within-opportunity	29
6.	Contribution of opportunity groups to total inequality	30

Appendix

Table 1:	Different types of opportunities	37
Table 2:	Different groups of opportunity	38
Table 3:	Descriptive statistics on standardized height according to groups of opportunities (1998)	39
Table 4:	Descriptive Statistics on standardized height according to groups of opportunities (2013)	39
Table 5:	Results of inequality of within and between groups opportunity (1998)	39
Table 6:	Results of inequality of within and between groups opportunity (2013)	39
Table 7:	Contribution of opportunity groups (1998)	40
Table 8:	Contribution of opportunity Groups (2013)	40

List of figures

1.	Regional distribution by deciles of standardized height	24
2.	Residential distribution by deciles of standardized height	24
3.	Educational level of the mother distribution by deciles of standardized height	25
4.	Level of wealth distribution by deciles of standardized height	25

Abstract

The literature on public health shows that health status of children and their nutritional status influence their health and well-being in adulthood. Therefore, policies to improve the health status of a population must consider children's health and take into account all the elements that can influence child health status.

The inequality of opportunity (lack) and efforts (behaviour in relation to health) towards improvement of the health status and mortality of individuals raises the issue of unequal distribution of health in a given population. However, this subject is relatively less discussed in the literature on public health in developing countries, including Togo. By focusing on health inequalities of opportunity, we analyze their evolution and contribution to children's health (as measured by the standardized height) in Togo using data from Demographic and Health Survey (DHS) 1998 and 2013. The objective of this study is to measure and compare the importance of the contribution of inequality of opportunity (from differences in life circumstances) to total health inequality of children under 5 years. Because children are not accountable for any part of their health outcomes by age five, total inequality is decomposed into a part due to inequality of opportunity (observed variables) and another part due to other unobserved factors (inequality within opportunities) after controlling for the inequality from random variations in the health status of children or genetic variations from a reference population (healthy population).

The methodological approach is based on decomposable general entropy measures such as the Theil-T index to measure total inequality after dealing with natural variation in the height of children. This inequality is decomposed into within- opportunities inequality and the between-opportunity (inequality of opportunity) by using a non-parametric approach after building the opportunity groups with the selected circumstances variables.

The results show that the total health inequality experienced a decline between 1998 and 2013 from 0.65 to 0.26 in 15 years. This decrease is also observed for the inequality of opportunity and in within opportunity. The contribution from inequality of opportunity (inter-group inequality of opportunity) has increased over the period 1998-2013. It increased from 0.14 to 0.18, respectively, in 1998 and 2013. These relatively low levels of inequality of opportunity are interpreted as an estimate of the lower bound of the set of variables in circumstances that may influence the children's health. In view of the results, the increase in the level of inequality of health opportunities comes more from the increase in the contribution of the unfavourable opportunities group.

Keywords: Health inequalities, Social inequalities in health, Inequality of opportunities in health

1. Context and justification

The poverty ratio in the Togolese population fell from 61.7% in 2006 to 58.7% in 2011. A decrease in poverty across the country by three percentage points was observed between 2006 and 2011 despite a steady upward growth recorded in 2003. This decline in poverty occurred both in rural and urban areas. Despite this extensive decline depending on the environment, the fact remains that poverty is mainly a rural phenomenon, with over 73% of this population living below the poverty line. This decline in the poverty rate of 3% between 2006 and 2011 shows that there has been progress in fighting poverty in Togo, even though poverty remains high. The objective of reducing the incidence of poverty to the target level set in 2015 was out of reach in Togo.

Several authors have identified inequality as one of the factors preventing the achievement of the 2015 target with respect to poverty reduction. Inequalities appear increasingly at the heart of debates on the effectiveness of policies implemented to reduce the phenomenon of poverty. Reflections on measuring and reducing inequalities are today preferred research topics in economics.

The literature on development economics has focused for some time on the complex relationship between growth and inequality. Thus, for trickle-down development theorists (Kuznets, 1955), reduction of inequality and poverty results from the growth process. However, for those of pro-poor growth, growth is not a sufficient condition and it is, therefore, necessary to distinguish between a "growth effect" and an "inequality effect"¹ (Ahluwalia, 1976; Dollar and Kraay, 2002; Ravallion and Chen, 2003; and Bourguignon, 2004). The process of poverty reduction and consequently reduced inequality represents a fundamental challenge that all developed and developing countries face.

The emphasis on inequality leads us to wonder about the kind of inequality being discussed. Most studies of the "poverty-growth-inequality" triangular relationship refer to income inequality only when they speak of inequality in general. However, in a multidimensional perspective, the poverty and welfare of an individual depends not only on income but also on several other dimensions such as health, education, water, shelter, food, sanitation, information, etc. The multidimensional approach to poverty reflects social inequality; that is to say inequality in the satisfaction of certain basic needs. Thus, to the unequal distribution of income is added the one observed in access to basic services such as education and health.

For some commentators, including Nobel Prize in economics holders such as

James Tobin (1970) and Amartya Sen (2002), health inequalities are principally more disturbing than other dimensions of human development. By entering this logic without neglecting the importance of other types of inequality, we will focus on inequalities of health opportunity.

Health and health care are an integral part of people's ability to run their talents to flourish as human beings. As Sen (2002) points out, health is among the most important conditions for human life and at the same time a highly important component of human capacity that it is necessary to assess.

2. Problem statement and research questions

Social health inequality, that is to say, differences in health status between social groups, now exists in all European countries as well as developing ones, including Togo. In its report, the Commission on Social Determinants of WHO (2008) launched an urgent appeal to put in place policies to reduce health inequalities, since systematic differences in health are simply unfair. Health inequalities can have two sources: the first relates to the individual and the second is the social environment. Some authors such as Cohen (1989) and Roemer (1998) have criticized the approaches that are limited to the analysis of total inequality while ignoring the part of individual responsibility in the observed realization of achievements. They suggest that differences in achievements are generally explained by two factors: individual effort and circumstances.

Recent publications in health economics have focused on showing the difference between legitimate causes of health inequalities (Bricard and Jusot, 2012; Dias, 2009; Fleurbaey and Maniquet, 2006; Fleurbaey and Schokkaert, 2009; Jusot, Tubeuf and Trannoy, 2013; Rosa Dias, 2010; Rosa Dias and Jones, 2007; Sen, 2002). The main discussion revolves around the fact that the differences observed in the health status are explained by factors for which the individual may be held responsible, such as efforts and those factors for which the individual may not be responsible, such as life circumstances. The distinction between effort and circumstances is at the heart of the implementation of policies of equal opportunities and is based on the concept of individual responsibility.

The new normative and social debates abandon the concept of total inequality and focus on inequality of opportunity. This new concept aims to assess the effects of inherited social factors such as family history, gender, place of birth and ethnic origin on health status, achievements and goals of individuals. Inequality of opportunity has a bad effect on society because it represents a violation of the principles of social justice (Roemer, 1998) such as equal rights and fairness of situations. Unfortunately, the inclusion of these new debates in the analysis of health inequality is much more pronounced in developed countries than in developing ones. This leads us to question Togo's situation regarding the analysis of inequality, taking into account the inequality of opportunity.

Although the literature on inequalities of health opportunity is primarily devoted to developed countries, weak health institutions and the lack of universal health

coverage in Togo makes connection between the circumstances of life, efforts and the health status of individuals even more problematic. In the 1970s, the international Alma Ata conference led to the confirmation by the United Nations system and governments that the concept of basic healthcare that emerged from the conference was a new and important area that should be based on the development strategy adopted by the United Nations system in the field of public health. This concept was also considered to be a basic tool of achieving the goal of universal access to health care, represented globally by the slogan: Health for All by 2000. But the figures cruelly reveal that most governments in developed and developing countries are today far from reaching this goal of health for all. Togo is not spared. According to the 2012 report on the situation of poverty in the West Africa Economic Monetary Union (WAEMU), health indicators are relatively high compared to the target level. Indeed, between 2005 and 2010, the rate of deliveries assisted by medical or paramedical personnel increased to 11.0% in Togo against 1.0% in Benin, 9.0% in Guinea-Bissau, 8.0% in Mali and 2.0%. It fell by 3.0% in Burkina Faso and 6.0% in Côte d'Ivoire.

Togo's DHS data analysis (1998 and 2013) shows that child health status measured by their height status deteriorated by 5.7 percentage points between 1998 and 2013 (Table 1).

Table 1: Changes in health status (stunting) in Togo from 1998 to 2013

Data Source	Years baseline	Moderate and severe retardation of growth (height for age in %)		
		Rural	Urban	Total
EDS T2	1998	27.95	16.13	21.7
EDS T3	2013	32.2	16.2	27.4

Source: Compiled from data from DHS in 1998 and 2013 and their reports

Children suffering from stunted growth appear more concentrated in rural than urban areas. From 27.95% in 1998, they increased to 32.2% in 2013 in rural areas against 16.13% and 16.20%, respectively, in 1998 and 2013 in urban areas. Degradation of stunting is more pronounced in rural than urban level. By region, 12.84% of children suffering from stunted growth in 1998 lived in the town Lomé against 33.67% in Savannah, where the prevalence of poverty is very high. In 2013, they represent 14.80% in Lomé against 33.40% in Savannah. According to the level of education of the mother, the mothers of 29.25% of these children were without education in 1998 against 20.88% and 12.68%, respectively, of mothers with primary and secondary level of education. In 2013, 32.20% of the children came from mothers without education level, 25.40% of mothers with a primary level and 19.0% of mothers with secondary-level education. This association between nutritional status and socio-demographic conditions is also observed for the parents' level of wealth. The infant and child mortality rates are still very high in Togo. According to the DHS Togo 2013, the infant mortality rate is 49 per thousand against the MDG target of 29 per thousand in 2015,

and the mortality of children under 5 years is 89 per thousand against a MDG target of 51 per thousand in 2015. In these circumstances, the probability of achieving targets set for 2015 compared to the reduction of under-five and maternal mortality reduction is low.

The attention to inequalities of health opportunity can be explained by the following reasons: First, the scarcity or quasi-absence of empirical studies on Togo with a focus on this type of inequality. The second is the importance of taking into account the influence that the circumstances of life and efforts can have on the health status of individuals (Roemer, 1998). The analysis of inequalities of health opportunities is relevant because it will help policy makers detect variables of life circumstances that an individual cannot control but which influence his health status. In the context of health, life circumstances of childhood, gender, the socio-economic characteristics of the parents and their cognitive abilities belong to the first category of variables (circumstances), while the choice and lifestyle (behaviours) belong to the second (efforts).

From the foregoing, it should be noted that health inequality and health opportunity in particular is a reality in Togo. To achieve the development goals of this country in the short and long term, this problem must be tackled through social and public health policy by reducing inequalities and improving the health status of individuals. To accomplish this, a condition to these actions is to better understand the inequalities of opportunity and to analyze the relationship between the variables of the circumstances of life and the health status of children. In the literature on inequality of opportunity, most of the studies use cohort data for monitoring the course of an individual from childhood to adulthood. This data is used to isolate the living circumstances variables of childhood from effort variables, which adults are responsible for.

Because of the lack of this kind of data and drawing on the work of Pradhan, Sahn, and Younger (2003) and Assaad et al. (2012), we focus on children and decompose the total health inequality (from the standardized height of children) in inequality of opportunities (observable variables considered) and the residual (unobservable variables) after checking inequality from natural variations in a healthy reference population. Based on this principle, the following questions will be explored: (i) what is the magnitude and trend of total health inequalities among children? (ii) What is the significance and evolution of inequality of opportunity in differences observed in health status of children under 5 in Togo? (iii) What opportunity groups act more on the children's health status?

The answers to these questions, especially in the case of Togo, will nurture discussions between researchers and policy makers for the definition and implementation of new and affective public health policies in the post-2015 agenda.

3. General objective and key assumptions

The objective of this research is to decompose total children's health inequality in part that is due to inequality of opportunity and part due to residual inequality from other factors after controlling for random variations in health and genetics from a healthy population reference.

Specifically, it is a matter of:

- Determining the extent and development of total children's health inequality from 1998 to 2013;
- Identifying the share and the trend of inequality of opportunity by decomposing total inequality in inequality from selected life circumstances and inequality from other unobserved variables; and
- Comparing, following years, the contributions of each group of opportunities (built from selected life circumstance variables) to health inequality among children.

To achieve these objectives, the following assumptions are made:

- (i) H1: total health inequality has decreased over the period 1998-2013.
- (ii) H2: the contribution of inequality of opportunities to total health inequality has decreased over the period 1998-2013.
- (iii) H3: the group of unfavourable opportunities is one that contributes most to the inequality of health opportunity.

4. Theoretical and conceptual framework for the inequality of health opportunities

The concept of equal opportunity is based on the concept of human rights and non-discrimination. Equal opportunity is a requirement that the social status of individuals of one generation no longer depend on the moral, ethnic, religious, financial and social characteristics of previous generations. This vision of equal opportunity is one of the foundations of the justice theory (Rawls, 1971). Assuming that there is a distribution of natural assets, individuals who are at the same level of talent and ability and have the same desire to use them should have the same prospects of success regardless of their initial place in the social system. The critical distinction between outcome differences that are attributable to individual responsibility and those that are not has played a central role in the literature on the analysis of inequality.

According to Rawls (1971), the first basic principle of justice required that the most extensive liberty for each must be consistent with similar liberty for others. The second principle postulated that primary goods that provide basic opportunities should be available to all members of society. With these different principles, Rawls proposed that the optimal allocation of primary goods would maximize the share of the least privileged group. In 1981, Dworkin equated fairness with equality of resources rather than outcomes. Thereafter, Arneson (1989) spoke of equality of opportunity for welfare, rather than welfare itself. It is important to note that details and nuances differ across these various authors. But the common thread was a redefinition of what Cohen (1989) calls the “currency of egalitarian justice”. It seemed to most writers that fairness required the equality of something, but given the role of individual responsibility, it was clear that it was not simply the equality of outcomes.

Economists also use this concept when analyzing equality of outcomes. In 2006, the World Development Report on Equity and Development adopted a notion of fairness that is based on equality of opportunity. The often used definition of this concept is that of Roemer (1998). He spoke of the outcome of interest as an “advantage” and divided the determinants of advantage into two groups (efforts and circumstances). Efforts are subject to individual choice when circumstances are factors that lie outside the individual’s control. Equality of opportunity would prevail in a situation in which the distribution of an outcome of interest is independent of circumstances. On the other hand, we talk about inequality of opportunity.

In the field of health, the factors causing health inequalities considered unfair and avoidable can be grouped into four categories (Whitehead and Dahlgren , 1991): (i) the adverse health behaviours in situations where the individual has very little choice

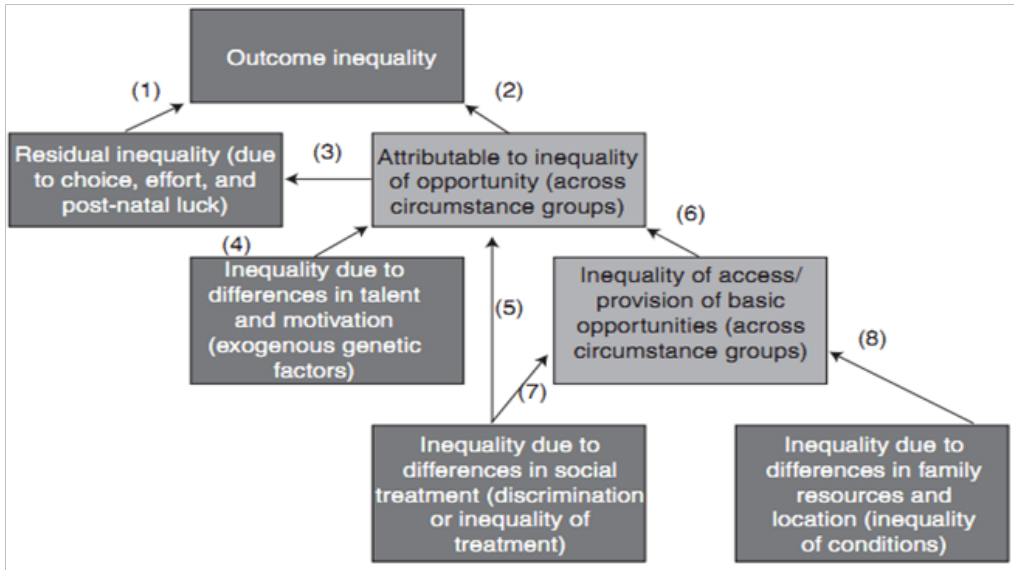
of lifestyle; (ii) exposure to living conditions and unhealthy working or causing stress; (iii) inadequate access to essential health services and other basic public services; and (iv) the natural or social mobility selection linked to health by that sick people tend to regress in the social scale.

There is emphasis that many of the factors that influence health status are not directly controllable by the individual himself. Thus, the most disadvantaged are more likely to be affected by inequality because they have few opportunities to improve their physical and environmental conditions. All factors underlying health inequalities are not considered in the same manner from the perspective of social justice. This is what explains the fact that discussion of these factors, including the relative importance of social factors and behavioural factors have consequences from the standpoint of equity. Roemer (1998), one of the theoreticians of equal opportunities, provides a theoretical framework that partitions the explanatory factors for which the individual can be held responsible, known circumstances and factors for which one can be held responsible, called efforts.

Thus, the determinants of health are not equivalent in terms of equity, and the living conditions in childhood would be considered as totally illegitimate factors as risk behaviours, which result from individual choices, are the subject of the debate about the legitimacy of their consequences. Following Ahlburg (1998), Rosa Dias (2010) and Jusot, Tubeuf and Trannoy (2010), we realize that the debate becomes especially complicated if risk behaviours are not the result of a totally free choice. In addition, these behaviours are influenced by circumstances suggested by the hypothesis of inter-generational transmission of preferences for health and risk behaviours.

We can identify two normative positions in the debate on the distinction between illegitimate and legitimate factors underlying health inequalities (Fleurbaey and Schokkaert, 2011 ; Jusot, 2014). For the first, individuals are held responsible for their preferences even if there is an influence of circumstances on risk behaviours. The second considers that individuals are responsible for their decisions only if they are not influenced by circumstances and only if the individual has control over them (Arneson, 1989; Roemer, 1998; Roemer, 1993). This normative debate on equity in the underlying factors of health inequalities as well as the legitimacy of efforts related to the circumstances called for further research on the consequences in terms of health inequality (Fleurbaey and Schokkaert, 2009; Roemer, 1998).

Conceptually, all these positions and theory can be summarized as follows:



Source : de Barros (2009), First Section

According to the figure, the total health inequality (outcome inequality) is decomposed into residual inequality and inequality of opportunity through different groups of circumstances. The latter is divided into three types of inequality. The relationship between residual inequality and the inequality of opportunity hark back to the debate between Roemer (1998) and Barry (2005).

5. Empirical evidence approaches of measuring the inequality of opportunities

Literature on inequality of opportunity is abundant for developed countries and focuses on the relationship between life circumstance variables, the health status of individuals and effort variables that come from the behaviour of individuals themselves. This relationship has been addressed independently by well-developed research. These are: the literature on the impact of long-term childhood life circumstances (Currie and Stabile, 2006) and (Lindeboom, 2006), the analysis of the empirical relationship between education and health (Arendt et al., 2008; Cutler and Lleras-Muney, 2006); Oreopoulos (2007) ; (Van Kippersluis et al., 2010) and (Cutler and Lleras-Muney, 2012), the economics of human development (Feinstein, 2003; Heckman and Rubinstein, 2001) and contributions to the relationship between the health status and lifestyle (Balía and Jones, 2008). Establishing a link between these various researches, empirical analysis of inequality of health opportunity has also led to an integrated approach to the determinants of health in the context of human development.

Recent studies on the measurement or estimation of inequality of opportunities most often use parametric approach coupled with the non-parametric. But for some studies, these two approaches are used separately. The non-parametric approach is an approach which leads to splitting the total population (over covered by the study) in categories of circumstances (types) of individuals and groups with the same effort (tranches). The types are constructed so that an individual belongs to one kind and that members of one type have the same circumstances. For the tranches also, an individual must belong to a single tranche with others who have the same effort as him.

The non-parametric approach is used in several studies such as that of Cogneau and Mesplé-Somps (2008) on "Inequality of opportunity for income in five countries of Africa". They examine for the first time the inequality of income opportunities in Africa through an analysis of a large database providing individual information on family history. The study was conducted on Côte d'Ivoire, Ghana, Guinea, Madagascar and Uganda. The non-parametric approach has led to the construction of six (6) types from three (3) circumstances of groups, namely: the occupation and education of parents and region of birth. Using household consumption per capita, they found that in 1988, Ghana is a country where inequality of income opportunities is lowest among individuals with different social backgrounds while it is higher in Madagascar in 1993. The decomposition of inequality reveals that

inter-generational mobility of education and occupation is much more important in the English colonies than those of France.

The evaluation of the contribution of inequality of opportunities to income inequality has also been studied in Egypt (Hassine, 2012). The author has assessed and analyzed the evolution of the contribution of inequality of opportunities for income inequality for three periods and different population groups. The parametric approach and the non-parametric approach were used and resulted in estimates of the lower bound of the level of inequality of opportunities for employees. The non-parametric approach is based on seventy-two (72) constructed types from the circumstances of variables such as: gender, education and occupation of father, the mother's education and region of birth. Using the total monthly income as the dependent variable, the results show that, on average, the contribution of inequality of opportunities (due to deductions circumstances) to income inequality decreased 22% in 1988 to 15% in 2006.

The results also show that while income gaps are widening dramatically, levels of inequality of opportunity remained stable. The effect of family history (especially that of the father) and the geographic origin are more important on total income despite an increase in the impact of mother's education in recent years. He also found that the level of inequality of opportunity does not differ significantly by gender or a rural to urban space, although the incidence was lower for males and in rural areas. For the age groups, the results indicate an increase in the inequality of opportunities with lower spread of opportunities for the older generation.

The non-parametric approach is also used by Checchi and Peragine (2010) to an ex-ante and ex-post estimates of inequality of opportunity in Italy. They use family history as variable circumstances to compare inequality of opportunities for different sub-groups of the population that share the same degrees of labour market conditions and those of female participation to the labour market. Family history is characterized by the highest level of parental education. In their ex-ante estimate of inequality of opportunities, the value of all the opportunities is measured by the average income by type. For the ex-post estimation, inequality of opportunity is measured as the difference between the actual inequality of income distribution and inequality in a counterfactual distribution where individuals are assigned the average income slice to which they belong. Using the mean log deviation as an index of inequality, the results of the ex-ante estimate of inequality of opportunities show that it represents 15% of total income inequality against 20% in the case of the ex-post estimate. They also find that inequality of opportunity is highest among women in southern Italy.

For Ferreira and Gignoux (2011), both approaches (parametric and non-parametric) were used in estimating the inequality of opportunities of the household's income per capita in six (6) countries in Latin America. Deduction circumstances variables include education of the father and the mother, the father's occupation, ethnic origin and region of birth. The application of the parametric approach initially allowed to classify countries in descending order, according to the inequality of opportunity levels. It appears in Brazil the inequality of income opportunities is the most significant. It is

followed by Guatemala, Panama, Peru and Colombia. Secondly, they applied the non-parametric approach to the same data and countries. The results are very similar to those found with the parametric approach.

These approaches (parametric and non-parametric) were also put into use by Assaad et al. (2012) in their work on health inequality of opportunities among children in the Arab world and Turkey. Following the non-parametric approach, these authors use the place of residence, wealth index of parents and education of the mother as circumstances of variables in the construction of types and ranges. The results show that the application of the parametric approach and the non-parametric by types led, in general, to the same trend of inequality of opportunities but with low levels. They explained the low levels of unequal opportunities by the small number of circumstances considered variables related to the unavailability of certain variables in the databases used.

Unlike the non-parametric approach by types, the results indicate that the non-parametric approach by tranches tends to overvalue the contributions of inequality of opportunities to total health inequality in children.

6. Methodology

Justification of the choice of child health indicator

The review of literature shows that several indicators can characterize and measure the health status of an individual or a given population. Among these indicators, the most used are: mortality, morbidity and life experience. Monetary variables are also used particularly in the comparison of the well-being of an individual or population in time and space. But the use of these indicators raises important issues that make the measurement and characterization of the health status inappropriate. Since death remains a rare event even in poor countries, studies using infant mortality must be made with a larger sample (Mosley and Chen, 1984). Let us take as an example a study of inequality with discrete variables. The use of child mortality requires an estimate of the probability of death for each child. But econometric mortality models suffer from poor predictive capability, such that the variation in predicted mortality will be substantially less than the real variation in mortality probability. Accordingly, the use of predicted mortality leads to under-estimating inequality. These pitfalls of measurement should be taken even more seriously when it comes to a quantitative analysis of health status, such as proposed in this work.

In order to avoid these difficulties in the measurement of health, we use in this paper the standardized height of children under 5 years of age as an indicator of the child health status. The use of the height of the children in the analysis of inequalities in health and opportunity is motivated by the existence of many works of research in medical and public health, indicating that it is an objective indicator of the general children health status (Berman et al., 1994; Bicego and Ties Boerma, 1993; Cole and Parkin, 1977; Mosley, 1984; Mosley and Chen, 1984; and WHO, 1995a, b).

According to reports from the WHO (World Health Organization) 1983-1995, the proper measure of the magnitude of the deficit of children health status is the deviation of the distribution of the height in the population derived from the distribution of a reference population of healthy children who reach their genetic potential. This has guided many works in the measurement of health status and well-being in general. Based on the fact that infections and food shortages (to mention only these) are the main factors influencing the children's physical and mental growth, Onis et al. (2000) suggested that the best indicator of children's overall well-being is their growth status. De Onis et al. (2009) show in their work that children who are in

a favourable environment and are fed according to the WHO recommendations have, until the age of 5 years, identical growth in weight and in height worldwide, despite the ethnic diversity of the population.

From the foregoing and based on the conclusions of the work of Behrman and Deolalikar (1988) and Strauss and Thomas (1995), it is clear that the height of the child is used as the dependent variable in the economic literature on the modelling of health in developing countries. Because the distributions of heights of healthy children among populations are strictly comparable, we will focus our analysis on children's health. Specifically, the hypothesis supported by several researches is that there is non-variation of the distribution of the height of children in good health compared to groups such as ethnicity and race. But this hypothesis does not hide the influence that genetic factors can have on the growth of individuals in a well-nourished population (Habicht et al., 1974).

The benefits of choosing the height of children as an indicator of their health status is due to the fact that it does not suffer from self-declaration issues and that measurement errors are likely to be random (not systematically correlated with economic characteristics). Also, the height of the children makes it easy to ensure comparability in terms of measurement through surveys and samples used techniques.

In addition to the traditional indicators for measuring health status (mortality, morbidity, life expectancy, monetary indicators), we do not use anthropometric indicators (including the Z-scores) of children, which appeared more random than the standardized height that is advised (Pradhan et al., 2003).

Our analysis of health inequality is based on the height of children. Knowing that the variance of children's height naturally increases as children get older, we use a transformed height measure for our inequality analysis. The transformed height measure is standardized using a fixed age/sex reference group, which in our case is girls at 24 months of age. The standardized height measure is constructed such that the position, in terms of percentiles, is the same for actual height in the actual age/sex group and the transformed height in the reference group.

Following Pradian et al (2003), the standardized height can be written as:

$$h_s = F_{\bar{a}, \bar{g}}^{-1} \left(F_{a, g}(h) \right) \quad (1)$$

F is the distribution function of height in the NCHS population for the age group a and sex g of an individual, h is the current height of the individual in question and $\bar{a} = 24 \text{ months}$, $\bar{g} = \text{female}$, and the h_s which results is the standardized height .

Sources of data and variables

The main variables used are threefold. These are:

- socioeconomic characteristics,
- public health characteristics, and
- demographics.

This research will use data from the Demographic and Health Survey (DHS) for 1998 and 2013. This will be a quantitative analysis of cross-sectional data. The DHS surveys use three types of questionnaires. First is the questionnaire on 'household', which collects information about all the members of a household and the characteristics of their residence. Then the individual questionnaire 'women' is addressed to women from 15 to 59 years old in each household. The last one collects information on men from 15 to 59 years. Data about children are taken from the 'women' questionnaire. For the DHS in 1998, 7,517 households were interviewed, among which 8,569 were women from age 15-49, 3,819 men from 15-59 years old and 3,873 children under five years old. For the DHS 2013, 9,549 households were interviewed, among which 9,480 were women from age 15-49, 4,476 men from 15-59 years old and 23,076 children under five years old.

The main variables of interest are in the table below:

Table 2: Description of the variables of interest in databases

Variables	Terms
Socio-economic factors	
Mother's education	1. No education 2. Primary 3. Secondary 4. Higher
Parent's occupation	1. Unemployed 2. formal sector 3. Informal sector 4. Farmer
Place of residence	1. Urban 2. Rural
Régions	1. Lomé 2. Maritime 3. Plateaux 4. Central 5. Kara 6. Savannah
Social class	1. Very poor 2. Poor 3. medium 4. Rich 5. Very rich
Public health factors	
Place of delivery	1. House 2. Public health service 3. Private health service 4. Other
Cesarean delivery	1. No 2. Yes
Tetanus Vaccine	1. No 2. Yes
Types of water used in the household	1. Drinking water 2. Unprotected water 3. Other

Table 2 Continued

Variables	Terms
Public health factors	
Types of toilets available	1. Modern 2. Traditional 3. No toilet
Electricity	1. No electricity 2. Electricity available
Breastfeeding	1. No 2. Yes
Getting breastfeeding	1. Immediately 2. 24 hours after childbirth 3. Days after childbirth
Breastfeed	1. Don't breastfeed 2. Never breastfeed 3. Breastfeeding
Demographic factors	
Child height (centimetres)	
Child age (month)	
Child sex	1. Male 2. Female
Number of children in the household	
Gender of household's head	1. Male 2. Female
Age of mother at first birth (year)	
Mother's height (metres)	
Order of birth	
Birth interval	
If a child is part of a multiple birth	1. No 2. Yes
BMI index of the mother (kilograms per metre square)	

Source: from DHS data (1998 and 2013)

The method: Non-parametric approach

We choose to use the non-parametric approach because the parametric approach may not take into account the influence that circumstance variables can exert on each other. The non-parametric method solves this problem by building opportunity groups (opportunity types) from all life circumstances retained. According to this approach, the population is split in two ways. The first way allows us to divide the population into types (circumstances categories) of measurement of opportunities so that an individual belongs to only one group. Thus, members of the same type have the same circumstances.

The second way is based on the efforts variables and divides the total population into tranches with the same effort. Since the effort variables are unobservable, the total population is distributed over quintiles y_i (health status) conditioned by the circumstances, and all the individuals belonging to the same quintile are considered those that provide the same efforts. In other words, the tranches represent individuals of the same type in quintile.

Since our focus is on the children, in whose case we cannot observe effort variables,

the type approach appears as appropriate. We are aware that there is a potential interaction between children's living circumstances and government interventions. These interventions are public policies (free access to health care, immunization, school canteen availability) that influence children's health directly or indirectly through life circumstances. But since children cannot choose these policies, we capture their effects through the life circumstances considered.

Following the approach by the type, inequality of opportunities is the inequality between types. Direct measurement is based on a smoothing which leads us to consider a constant as reference to the value of the effort variables. Smoothing is done by replacing the values observed y_i on individuals by the middle u_c (smoothed distribution) of the types to which they belong. The level of inequality on $\{u_c\}$ is only due to the inequality of circumstance variables. This is referred to as direct measurement because it captures the inequality of opportunities on the variables that are considered as life circumstances individuals. Considering I as a measure of inequality, the value of the inequality of opportunities is directly given by:

$$\theta_{types}^d = I(\{u_c\}) \quad (2)$$

The proportion of inequality of opportunities in total inequality is expressed as a relative value by the following expression:

$$\theta_{types}^d = \frac{I(\{u_c\})}{I(F(y))} \quad (3)$$

With $I(F(y))$, total inequality.

Indirect measurement of inequality of opportunity with the non-parametric approach is done through a standardized distribution obtained by replacing values y_i^k observed on individuals i in the types c by $z_i^k = \frac{u}{u_c} y_i^k$, with u the overall average of y_i and u_c average y_i the type k . Through the $\frac{u}{u_c}$ standardized distribution, all cross-type inequalities are eliminated and there remains only intra-type inequalities or due to efforts. Following Ramos and Van de Gaer (2012), inequality due to opportunities can then be calculated as follows:

$$\theta_{types}^{ind} = I(F(y)) - I(\{z_i^k\}) \quad (4)$$

The proportion of inequality of opportunities in total inequality is expressed as a relative value by the following expression:

$$\theta_{types}^{ind} = 1 - \frac{I(\{z_i^k\})}{I(F(y))} \quad (5)$$

Non-parametric method has the advantage of not requiring a functional form to estimate inequality of opportunities.

Using this approach leads to the sub-division of the population of children under 5 in k types according to their circumstances. Children with the same vector of observed circumstances C are grouped in the same type k . Inequality of opportunities is achieved by breaking down observed inequality into inequality between types and inequality within types. The part of the inequality between types in total inequality is our measure of inequality of opportunity.

The main disadvantage of this approach is realistic with the whole situation. The number of types k is so great that the types of sizes are insufficient to obtain good estimates of inequality measures given the size of sample available. This is one of the reasons behind the construction of the opportunities groups.

Treatment of natural variation: Measuring total inequality of health and that of the genetic variation

By proposing to use the standardized height in the measurement of total health inequality, we must deal with the fact that, even in a perfectly healthy population, there are genetic variations in the individual's potential height. To neutralize this natural variation, the WHO's standard data (2006), which are representative of a healthy population, will be used. These data represent a population with overall well-nourished children regardless of ethnic and racial characteristics. In other words, changes in the distribution of child's height in this population will only be granted to any genetic variation. To capture health inequality, it will, therefore, deprive the total health inequality with inequality from genetic variations obtained from the reference population.

With the standardized height, we will use the Theil entropy index to measure inequality. Among the indices for measuring inequality, the GINI and decile ratio are best known. However, they fail to properly decompose total inequality into inequality within and between groups. For this, we use the general measures of entropy.

For a given population (P), the Theil index can be defined as:

$$I(P) = \frac{1}{N} \sum \ln \left(\frac{\mu}{h_{si}} \right) \quad (10)$$

where N is the sample size of the population (P), μ the mean standardized height in the sample, and

h_{si} is the standardized height of the i th child in the sample. $I(P)$ captures variation in heights due to the natural genetic distribution and any stunting due

to poor health.

Inequality due only to the genetic variations will be measured on a reference population of healthy children (standard of the WHO 2006). Applying the Theil index to this population, we have:

$$I(O\text{MS}) = \frac{1}{N} \sum \ln \left(\frac{\mu}{h_i} \right) \quad (11)$$

where N is the sample size of the population (P), μ the mean standardized height in the sample, and h_i is the standardized height of the i th child in the sample. $I(O\text{MS})$ captures only genetic variation.

Decomposition of inequality

Determining the health inequality without the effect of genetic variation

The health inequality $I(S)$ due to factors other than genetic variation is obtained through the following relation:

$$I(S) = I(P) - I(O\text{MS}) \quad (12)$$

Determining the inequality of health opportunity

The inequality of opportunity $I(OS)$ will be obtained by decomposing the $I(S)$ into inequality within and between groups of opportunity. Groups are defined according to the variables considered as opportunities for children. The variations of an opportunity to another will be captured by the between-group inequality. It is our measure of health inequality opportunity.

The functional form of the decomposition of $I(S)$ is as follows:

$$I(S) = \sum_{k=1}^K \frac{N_k}{N} [I(k)] + \frac{1}{N} \sum_{k=1}^K N_k \ln \left(\frac{\mu}{\mu_k} \right) \quad (13)$$

where μ is the average height for the entire sample, μ_k the average height for the population in the opportunity group k , N the entire sample size, and N_k is the sample

size of the population in the opportunity group k .

The inequality of opportunity represents the between-groups inequality in opportunities and can be put in the form:

$$I(OS) = \frac{1}{N} \sum_{k=1}^K N_k \ln \left(\frac{\mu}{\mu_k} \right) \quad (14)$$

The other part of the decomposition is the inequality of opportunities within groups and assigned to unobservable variables. We note that our index of inequality of opportunity is defined with respect to the reference group of girls at 24 months of age. But as children get older, genetic variation in heights increases and can influence our index of opportunity. To neutralize this influence, we will divide the index of health inequality by the one obtained with the healthy population of children with only natural genetic variation. Therefore, we get the following expressions:

$$I^*(S) = \frac{I(S)}{I(OMS)} = \sum_{k=1}^K \frac{N_k}{N} [I^*(k)] + \frac{\frac{1}{N} \sum_{k=1}^K N_k \ln \left(\frac{\mu}{\mu_k} \right)}{I(OMS)} \quad (15)$$

$$I^*(OS) = \frac{\frac{1}{N} \sum_{k=1}^K N_k \ln \left(\frac{\mu}{\mu_k} \right)}{I(OMS)} \quad (16)$$

With $I^*(OS)$ the inequality of health opportunity without the influence of genetic variations that increase with the age of the children.

Construction of opportunity groups

The construction of opportunities groups can be justified by two main reasons. Firstly, the partial effect of the circumstances of variables can be influenced when they are put together. As an example, it is obvious that the rural poor do not experience the same hardships as those in urban areas. If poverty negatively impacts children's health, the magnitude will not be the same whether children live in urban or rural areas. Then, when we consider all the circumstances of varying types to build k , they are so numerous that the sizes of the types are insufficient to obtain good estimates of inequality measures because of the sample sizes available.

The opportunities groups are built by grouping life circumstance variables (Table

2) that influence children's health. We obtain 1,580 types with all kinds of deductions circumstances (Appendix Table 1 where the first 26 types are presented). To have good estimates of measures of inequality, we group these types into three groups of created opportunities according to criteria defined on the characteristics considered most important.

In this part, we retain three variables in the construction of groups of opportunities. These are the area of residence (rural and urban), mother's level of education (higher, secondary, primary, no education) and social class (very poor, poor, medium, rich and very rich). The choice of these three variables can be explained by the importance of literature on their associations with individual health status. The positive role of parental education (especially the mother's education level) on children's health has been shown by Thomas, Strauss and Henriques (1990). Other authors such as Barrera (1990) and Deolalikar (1988), Glewwe (1999), and Koffi-Tessio et al. (2003) also addressed the relationship. Regarding the place of residence, some models (Grossman, 1972; Mosley, 1984) have shown the direct or indirect impact of community factors on children's health. Wealth (income) was considered the most significant variable in the child's health function (Thomas, Strauss and Henriques, 1991; Wolfe and Behrman, 1982) and to some extent it determines the amount of other inputs (food, shelter, clothing, health care, etc).

From these three selected dimensions, we define three groups of opportunities:

- unfavourable opportunities group;
- average opportunities group; and
- favourable opportunities group.

To classify each combination in a group of opportunities, we started from the idea that all three dimensions are equally important and that for each dimension terms have the same weight. Thus, when the combination has three terms that are not favourable to children's health, it is classified in the group of unfavourable opportunities. However, when favourable terms are present, it is classified in the group of favourable opportunities. When one or two terms in the combination is negative, we talk about the average opportunities group. The unfavourable group opportunities, therefore, include conditions such as: living in rural areas, have a low level (primary, no education) of education, being very poor (poor); live in urban areas, have low education and are very poor (low). Details on the different combinations are in Appendix Table 2.

7. Empirical estimation technique

All estimates are done with STATA software. First, we use the Theil index (whose algorithm is already in STATA) to capture the inequality in the distribution of children's health. We, therefore, consider that this inequality comes from the differences between and within groups of opportunities (the three groups built) and random variations in infant health. These random variations are achieved by using a healthy children population (OMS, 2006) where the inequality is only explained by these variations.

In STATA, we assign to each child the average of the group opportunities to which it belongs. This eliminates the intra-group opportunity differences, and inequality observed in this case is only explained by inter-group opportunity differences (inequality of opportunity). Knowing the share of inequality from random variations, the rest of the inequality would be due to within-group opportunity differences. To cancel the effect of the random choice of the reference group, we report (divide) the inequality obtained to the inequality estimated from the healthy population.

To capture the contribution of a given opportunity group, we assign it the value zero. This allows us to estimate the contribution of the remaining group opportunities. The contribution of the opportunity group in question will be the difference between the contribution of all groups and the remaining groups.

8. Results and interpretations

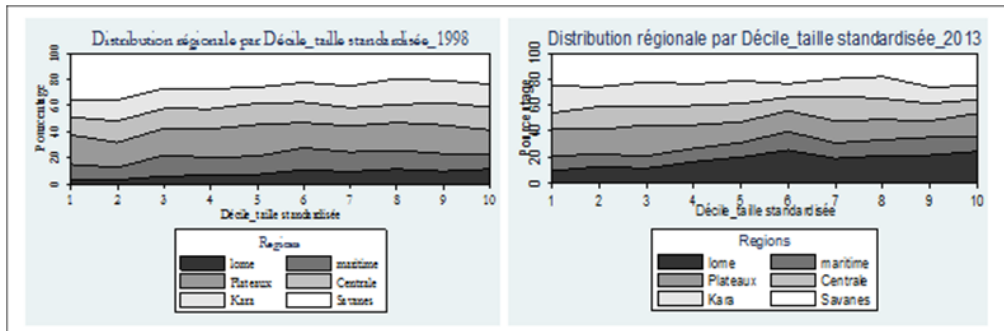
Description of the relationship between children's health (standardized height) and the various factors selected

The description of the relationship between the health of children and selected factors is made in figures 1-4, commonly called "Area chart". When the lines in these figures are straight and horizontal, it is concluded that there is no association between the health status of children and the factor in question. Otherwise, we speak of the existence of a relationship between the chosen factor and child health.

The shape of the lines of regional distribution (Figure 1) shows that there is an association between children's health and living areas of the parents. It shows that in 1998, children whose parents lived in the area of Savannah are more concentrated in the lower deciles of the height distribution. This concentration decreases gradually as it goes to the upper deciles. Compared to other regions, children whose parents lived in Lome are very poorly represented in the lower deciles of the height distribution. Whereas the lower deciles are characteristic of poor health, the Savannah region appears as the first region where many more children have poor health. It is followed by the Plateau region.

In 2013, we observe an improvement in the situation compared to that of 1998 on the Savannah region. Children are more represented in both the lower and upper deciles. This reflects an improvement in children's health status during the period 1998-2013. In Lome, children are concentrated in the highest deciles and in the middle of the height distribution. This is synonymous with good and average health status of the children in it. The Plateau region is the second region where a significant number of children has bad health conditions.

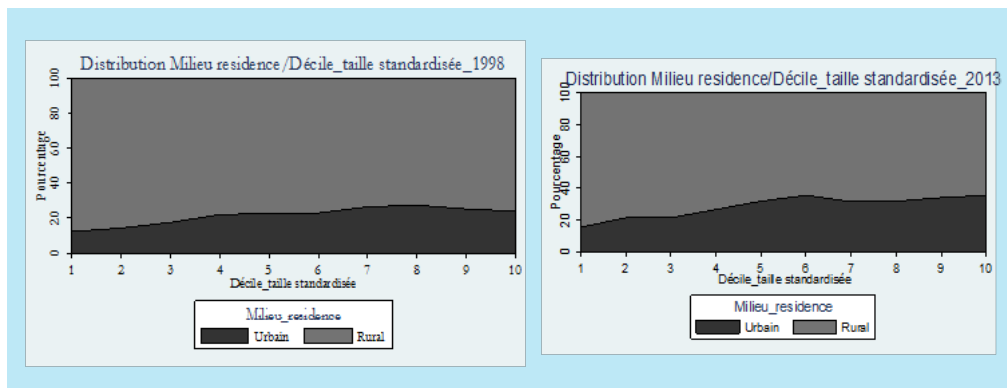
Figure 1: Regional distribution by deciles of standardized height



Source: Author based on data from EDS 1998 and 2013

Regarding the place of residence, Figure 2 below shows that children living in rural areas are more concentrated in the lower deciles. The number of children is becoming increasingly important in the higher deciles for children living in urban areas. This means that living in urban areas is associated with better child health, and rural areas with poor health status.

Figure 2: Residential distribution by deciles of standardized height



Source: Author based on data from EDS 1998 and 2013

Another step in the analysis of children's health status is the observation of the evolution of their standardized height. Our research is highly based on this step. Table 3 shows the distribution of the standardized height according to the different groups of opportunity retained.

Thus, we see that the proportion of malnourished children belonging to the class of 'Best opportunity' declined from the period between 1998 and to 2013.

In terms of the association between the educational levels of the mother, it is found that children of mothers with no education are more represented in the lower

deciles (Figure 3 below). This concentration decreases with the evolution of maternal education level. In 1998 as in 2013, it is evident that poor child health can be associated with the fact that the mother has no education (illiterate). However, health status improves with improvement in the educational level of mothers.

Figure 3: Educational level of the mother distribution by deciles of standardized height

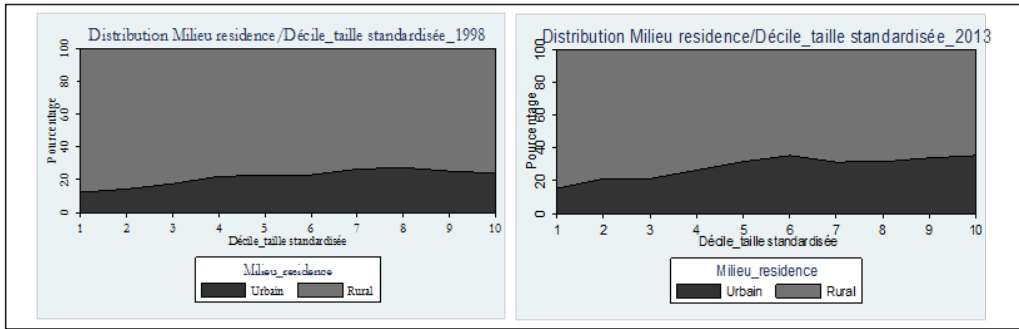
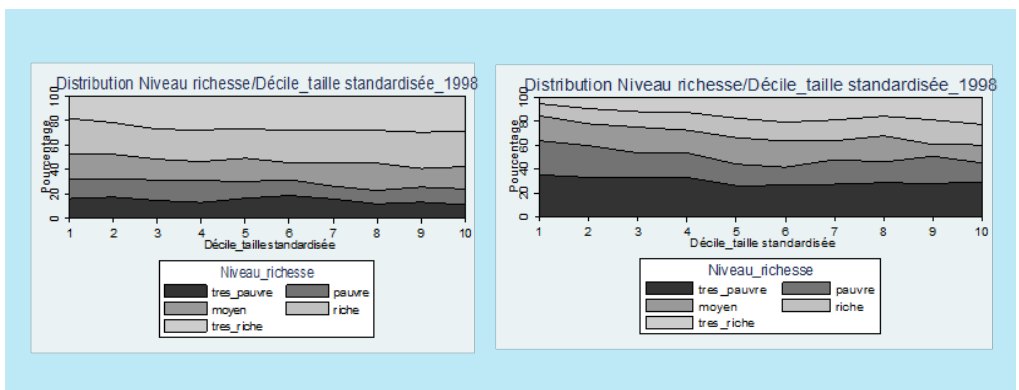


Figure 4 below shows the distribution of level of wealth by deciles of standardized height. It shows that the concentration of children from very poor, poor and middle-level households decreases when moving towards the higher deciles. By comparison, children are increasingly represented in the higher deciles when they come from rich and very rich households. It thus appears that children who are not from wealthy households are likely to suffer poor health.

Figure 4: Level of wealth distribution by deciles of standardized height



Source: Author based on data from EDS 1998 and 2013

Another step in the analysis of children's health is that of observing the evolution of their standard height. It is the latter that characterizes the children's health status. Table 3 shows the share of the population of children and distribution of standardized height in different groups of selected opportunities.

Thus, we see in the case of 1998 that children are more concentrated in the group of average opportunities and less in favourable opportunities with, respectively, 57.7% and 2.7% of the population of children. In 2013, the share of population of children is higher for the group with unfavourable opportunities; 58.7% of the population of children. Over the period 1998-2013, a movement of the number of children of the group of average opportunities to those with favourable and unfavorable opportunities is observed. This means that there has been a change to good or bad living conditions for some children between 1998 and 2013. But the deterioration of those conditions, represented by the passage from the medium opportunities group to the group of unfavourable opportunities, is more pronounced. The proportion of children in the unfavourable group opportunities increased by about 19.0% against 6.6% for the favourable opportunities.

The observation of the height distribution shows that, on average, the standardized height that characterizes the children's health is more important for the children in the favourable opportunities group in both years. This reflects a better state of health of children who are in this group. Note that the group "favourable opportunities" refers to children who have parents with a high level of wealth (and, therefore, are very rich or rich), who live in an urban environment and have a good level of education. All these features constitute circumstances that positively impact children's health.

For example, the fact that a child lives in an urban area can positively influence his health due to the presence of hospitals or other infrastructure to facilitate access to quality health care, and also availability of certain nutrients that are necessary for growth. Also, the importance of parental education has been repeatedly confirmed in most of the studies on the determinants of child malnutrition. Parents' education confers a gain in terms of reduction of chronic child malnutrition. This is verified by the arguments developed by Thomas et al. (1991) that the influence of education (kindergarten mainly) can be interpreted by a better understanding and access to the information needed to improve child health.

However, as we watch the group 'medium Opportunities', the average of the standardized height increased significantly from 82.05149 cm in 1998 to 82.62812 cm in 2013. This group is characterized by children living in combinations of favourable and unfavourable conditions. For these children, for example, the fact of living in an urban environment does not necessarily mean that they are healthy. This situation can be explained by the fact that parents may be poor, and may not have access to certain basic health services. The wealth of the parents also plays a big role.

Note also that the effect of the level of wealth on children's health is not as straightforward as one might imagine. The influence can pass through both elements; first through availability of food, that is to say that the higher the level of wealth, the more they are able to procure the necessary diet. Secondly is through the sanitary environment, since the household has the resources needed for normal use within a reasonable time for healthcare, thus avoiding early destruction of metabolism.

Regarding the group 'unfavourable opportunities', an increase in the average of the standardized height is also observed. It increased from 81.07374 cm in 1998 to 81.75740 cm in 2013. The group includes children with unfavourable living conditions; that is, having negative effects on children's health. This includes for example, children living in rural areas with very poor or poor parents with bad or average level of education.

Table 3: Share of the population, the average of the standardized height and relative average according to group of opportunity

	Share of the population		Average of the standardized height		Relative average	
	1998	2013	1998	2013	1998	2013
Favourable opportunities	0.02767	0.09358	84.29415	83.69454	1.03141	1.01797
Average opportunities	0.57749	0.31945	82.05149	82.62812	1.00396	1.00500
Unfavourable opportunities	0.39484	0.58697	81.07374	81.75740	0.99200	0.99441

Source: Author's calculation (see Tables 29 and 30 in annex to the results of G (0) and G (2))

Extent and evolution of total health inequality

We initially measure total inequality in the distribution of children's health in order to capture the contribution of inequality of opportunity due to differences between consisting opportunity groups. The general entropy measures are also used and allowed to have total inequality that varies according to the weight associated with differences in health levels.

In this part, interest is focused on the total inequality of private health random variations that can be observed in a population of children considered healthy, and the effect of the random choice of reference. Thus, the total health inequality would be obtained due to the circumstances observed and unobserved variables (random variations excluded).

Considering the Theil index, which assigns equal weight to distances along the entire distribution of children's health status, total health inequality (controlled for the effect of the random choice of reference) private of random variations amounted to 0.65 in 1998 against 0.26 in 2013 (Table 4). The level of total inequality decreased by 0.39 over the period 1998 to 2013, reflecting an improvement in the distribution of health status of children in 2013. The first assumption that total inequality fell over the 1998-2013 period is confirmed. The decrease in total inequality level is also observed for inequality with respect to the reference (0.00218 and 0.00166, respectively, in 1998 and 2013) and the private of random variations (0.00086 and 0.00034 in 1998 and 2013, respectively).

Table 4: Average of standardized height and total health inequality in 1998 and 2013

	1998	2013
Average of standardized height (in centimetre)	81.73	82.22
Total health inequality (reference: girls aged 24 months)	0.00218*** (0.0000611)	0.00166*** (0.0000646)
Total health inequality without random variations	0.00086	0.00034
Total health inequality (controlled for the effect of the random choice of the reference) without random variations	0.65	0.26

Source: Author's estimate from DHS data in 1998 and 2013

The levels of inequality observed show that it is a reality, and an important element to consider when analyzing children's health. This total health inequality is observed due to circumstances and those unobserved. These can be grouped into environmental and nutritional factors. The choice for a child to be born in favourable circumstances of his health is not possible, but it remains very important for a child to live in a healthy environment that is favourable. Numerous studies have highlighted the importance of the environment in which children live on childhood diseases. It shows that environmental factors play an important role in health inequality and influence children's health.

Regarding the spatial location variables, we have a place of residence or area of residence. Indeed, the environment is different from one region to another, and in many developing countries there is often unequal distribution of social and health infrastructure. By combining elements of the environment and spatial location, we make a total inequality decomposition to measure how much of the difference between the opportunities established groups contribute to the total health inequality.

Inequality of opportunity contribution and its evolution

To capture the contribution of inequality of opportunity to total inequality, we decompose total inequality into two types of inequality: inequality of opportunity (between-group opportunities) and within-group opportunity inequality. The between-group inequality of opportunity is what we call inequality of opportunity. In connection with groups of opportunities, the idea is to consider that a child cannot choose to belong to one group rather than another. Thus, belonging to the group 'favourable opportunities' or that of 'unfavourable opportunities' is not a children's responsibility. These groups' opportunities are required for children and unfortunately differently affect their health. The group of 'favourable opportunities' has characteristics that positively impact children's health while those of 'unfavourable opportunities' have a negative influence. From one group of opportunities to another, the children's health status varies independently of their will.

In Table 5 (1998 and 2013), the total health inequality is decomposed into inequality of opportunities and the within-group inequality of opportunities. In 1998, the relative

contribution of inequality of opportunity to total inequality is 0.14 while the within-group inequality of opportunities is 0.86. In 2013, the contribution of inequality of opportunity to total inequality is 0.18 against 0.82 for the within-group inequality of opportunities. We note that for the two years, the contribution of inequality of opportunity is small compared to that of the within group inequality of opportunities. This weakness of the contribution of the inequality of opportunity can be explained by the importance of unobserved variables and the weakness of the size of different groups of opportunities constructed from selected circumstances variables. The analysis of the contribution is based so much on the evolution over time of the contribution of inequality of opportunity to total health inequality. The estimate of the share (contribution) of inequality of opportunity is interpreted here as a lower bound estimate of the circumstance variables.

The decrease in total inequality level is not observed simultaneously for the inequality of opportunity and the within-group inequality of opportunities. If the contribution of the within-group inequality of opportunities has decreased in time, the contribution of the inequality of opportunity to total health inequality increases. This contradicts the hypothesis 2 that the inequality of opportunities has decreased over the period of the study. This can be explained by the fact that we take into account the influence that certain circumstances can have on each other. From 0.14 in 1998, the contribution of inequality of opportunity increased to 0.18 in 2013 against a decrease from 0.86 to 0.82 for the within-group inequality of opportunity.

The evolution of the level of contribution of inequality of opportunity shows that the effect of the difference between groups' opportunities has increased over the period 1998-2013. This increase in the contribution of the inequality of opportunity means that the difference between group's opportunities increasingly influences the distribution of children's health. This indicates that the different variables of circumstances that were used to build groups of opportunities differently impact children's health.

Table 5: Decomposition of total inequality in inequality of opportunity and the within-opportunity

Group	Years			
	Absolute value		Relative value	
	1998	2013	1998	2013
Between-opportunity inequality (inequality of opportunity)	0.0003	0.0003	0.14	0.18
Within-opportunity inequality	0.00188	0.00136	0.86	0.82

Source: Author's calculation (see Tables 31 and 32 in the appendix for the results of G (0) and G (2))

From these results, it appears that effective action on inequality of opportunity will require the reduction of the difference between the different groups of selected opportunities. To do this, it is necessary to capture the contribution of each group's opportunities to identify the group on which we will need to focus most.

Contribution of opportunities groups to total inequality

Table 6 below shows the contribution of group's opportunities to total inequality. As we described above, the level of total inequality decreased between 1998 and 2013 while that of inequality of opportunity is experiencing an increase. It then becomes necessary to know which group has contributed most to these developments during the reporting period.

The results show that in 1998, the group of 'unfavourable opportunities', followed by the group of 'average opportunities' contributed more to total inequality. Their contributions in absolute terms amounted to 0.00218 and 0.00217, respectively, for the group of 'unfavourable opportunities' and the group of 'average opportunities'. Their relative contributions are 1.0 and 0.99, respectively. By comparison in 2013, only the contribution of the group of 'unfavourable opportunities' is more important than that of other groups. Its contribution to total health inequality is 0.00183 in absolute value against 1.10 in relative value. This confirms the hypothesis 3 that the 'unfavourable opportunities' group is the one which contributes more to total health inequality.

Except for the group of 'average opportunities', the contributions of other groups experienced an increase between 1998 and 2013. The group of 'average opportunities' is experiencing a decline of 0.17 (in relative terms) of its contribution against an increase of 0.13 and 0.1 for the 'favourable opportunities' and 'unfavourable opportunities', respectively. The decrease in the contribution of 'average opportunities' group is more pronounced than the increase in the other groups.

Table 6: Contribution of opportunity groups to total inequality

	Total health inequality			
	Absolute value		Relative value	
	1998	2013	1998	2013
Favourable opportunities	0.00139	0.00128	0.64	0.77
Average opportunities	0.00217	0.00136	0.99	0.82
Unfavourable opportunities	0.00218	0.00183	1.0	1.10

Source: Author's calculation (see Tables 33 and 34 annexed to the results of G (0) and G (2))

Given the results, the decrease over time in the level of total health inequality and increasing the level of inequality of opportunities can be explained by the evolution of the contribution of different groups of opportunities constructed. It appears that the decline in total health inequality is followed by that of the within group inequality. This suggests that the decrease in total inequality level would come from the reduction in within group inequality. We can also consider that this reduction may come in part from the reduction in the contribution of 'average opportunities' group. But this relation is indirect because it requires an effect on inequality opportunities.

The level of inequality of opportunity has increased from 0.04 between 1998 and 2013. This increase is the combined effect of an increase in the contribution of 'favourable and unfavourable opportunity groups and a decrease in the 'average opportunities'. The decrease in the contribution of this group of opportunities may explain the weakness of the increase in the level of inequality of opportunity and thus contribute to reducing the level of total health inequality.

9. Conclusion and policy implications

Conclusion

The Theil index was used to measure the total health inequality in the distribution of the standardized height of the children. Inequality of opportunity here represents inequality due to differences between groups of opportunities built from the area of residence, education of parents and their social classes.

The non-parametric approach for the opportunity groups was used in measuring the inequality of opportunity, the within group inequality, and the contribution of different groups of opportunities.

The results showed that the level of total health inequality, the inequality of opportunity, and within group inequality have not experienced the same change over time. While inequality of opportunity increased between 1998 and 2013, total health inequality and the within group inequality have decreased over the same period. From 0.14 in 1998, the level of inequality of opportunity stood at 0.18 in 2013. The total health inequality has changed from 0.65 to 0.26 between 1998 and 2013 against 0.86 and 0.82 for the within group inequality.

Compared to the contribution of different groups of opportunities, it is noted that their magnitudes and trends are not the same. If the contribution of some groups to total health inequality decreases over time (average opportunities), the other types of opportunities experience an increase in their contribution over time (favourable and unfavourable opportunities). These results show the importance of taking into account the issue of inequality of opportunity in efforts to improve children's health.

Economic policy implications

Results show that inequality of opportunity is a reality and contributes to inequality in the distribution of children's health status (measured by height for age index) in Togo. To significantly reduce inequality of opportunity and improve the health of children, it is important to have a better understanding of the circumstances in which children live and which impact negatively on their health. This would probably lead to an effective reduction of infant mortality, starting with a reduction of inequality opportunity health in children.

Given our results, an effective policy for reducing inequality of opportunity will be one that will improve the living conditions of the parents and improve their levels of wealth. This will cut down the differences between opportunity groups by providing the same opportunities to all children.

Notes

According to the pro-poor growth theory, poverty reduction goes through a “growth effect”, which measures the impact of an improvement of average income in the absence of evolution in its distribution, and an “inequality” effect, which results in a change in the distribution of income in the absence of any variation of the average income.

References

- Ahluwalia, M. S. 1976. "Inequality, poverty and development". *Journal of Development Economics*, 3(4): 307–342.
- Arendt, D., Denes, A. S., Jékely, G. and Tessmar-Raible, K. 2008. "The evolution of nervous system centralization". *Philosophical Transactions of the Royal Society of Biological Sciences*, 363(1496), 1523–1528.
- Arneson, R. J. 1989. "Equality and equal opportunity for welfare". *Philosophical Studies*, 56(1), 77–93.
- Assaad, R., C. Krafft, Hassine, N. and Salehi-Isfahani, D. 2012. Inequality of opportunity in child health in the Arab world and Turkey. *Economic Research Forum*, Cairo, Egypt. Working Paper No. 665.
- Balia, S. and Jones, A. M. 2008. "Mortality, lifestyle and socio-economic status". *Journal of Health Economics* 27(1), 1–26.
- Behrman, J. R. and Deolalikar, A. B. 1988. Health and nutrition.
- Berman, P., Kendall, C. and Bhattacharyya, K. 1994. "The household production of health: Integrating social science perspectives on micro-level health determinants". *Social Science and Medicine*, 38(2): 205–215.
- Bicego, G. T. and Ties Boerma, J. 1993. "Maternal education and child survival: A comparative study of survey data from 17 countries". *Social Science and Medicine*, 36(9): 1207–1227.
- Bourguignon, F. 2004. "The poverty-growth-inequality triangle". *Poverty, Inequality and Growth*, 69.
- Bricard, D. and Jusot, F. 2012. "Milieu d'origine, situation sociale et parcours tabagique en »rance". *Économie Publique/Public Economics*, (28-29), 169–195.
- Cohen, G. A. 1989. "On the currency of egalitarian justice". *Ethics*, 906–944.
- Cole, T. J. and Parkin, J. 1977. "Infection and its effect on the growth of young children: A comparison of The Gambia and Uganda". *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 71(3): 196–198.
- Currie, J. and Stabile, M. 2006. "Child mental health and human capital accumulation: The case of ADHD". *Journal of Health Economics*, 25: 6: 1094–1118.
- Cutler, D. M. and Lleras-Muney, A. 2006. Education and health: Evaluating theories and evidence. National Bureau of Economic Research.
- Cutler, D. M. and Lleras-Muney, A. 2012. Education and health: Insights from international comparisons. National Bureau of Economic Research.
- de Barros, R. P. 2009. Measuring inequality of opportunities in Latin America and the Caribbean: World Bank Publications.

- De Onis, M., Garza, C., Onyango, A. and Rolland-Cachera, M. F. 2009. Les standards de croissance de l'Organisation mondiale de la santé pour les nourrissons et les jeunes enfants. *Archives de pédiatrie*, 16(1), 47–53.
- Dias, J. C. P. 2009. Elimination of Chagas disease transmission: Perspectives. *Memórias do Instituto Oswaldo Cruz*, 104, 41–45 .
- Dollar, D. and Kraay, A. 2002. "Growth is good for the poor". *Journal of Economic Growth*, 7(3): 195–225.
- Dworkin, R. 1981. "What is equality? Part 1: Equality of welfare". *Philosophy and Public Affairs*, 185–246.
- Feinstein, L. 2003. "Inequality in the early cognitive development of British children in the 1970 cohort". *Economica*, 70(277): 73–97.
- Fleurbaey, M. and Maniquet, F. 2006. Compensation and responsibility.
- Fleurbaey, M. and Schokkaert, E. 2009. "Unfair inequalities in health and health care". *Journal of Health Economics*, 28(1), 73–90.
- Habicht, J.P., Yarbrough, C., Martorell, R., Malina, R. and Klein, R. 1974. Height and weight standards for preschool children: How relevant are ethnic differences in growth potential? *The Lancet*, 303(7858): 611–615.
- Heckman, J. J. and Rubinstein, Y. 2001. "The importance of noncognitive skills: Lessons from the GED testing program". *American Economic Review*, 145–149.
- Jusot, F., Tubeuf, S. and Trannoy, A. 2013. Les différences d'état de santé en France: inégalités des chances ou reflet des comportements à risques?
- Kuznets, S. 1955. "Economic growth and income inequality". *The American Economic Review*, 1–28 .
- Lindeboom, M. 2006. Health and work of older workers. *The Elgar Companion to Health Economics*, 26.
- Mosley, W. H. 1984. "Child survival: Research and policy". *Population and Development Review*, 3–23 .
- Mosley, W. H. and Chen, L. C. 1984. "An analytical framework for the study of child survival in developing countries". *Population and Development Review*, 25–45 .
- Onis, M. D., Frongillo, E. A. and Blössner, M. 2000. "Is malnutrition declining? An analysis of changes in levels of child malnutrition since 1980". *Bulletin of the World Health Organization*, 78(10): 1222–1233.
- Oreopoulos, P. 2007. "Do dropouts drop out too soon? Wealth, health and happiness from compulsory schooling". *Journal of Public Economics*, 91(11): 2213–2229.
- Organisation mondiale de la Santé. 2008. Rapport sur la santé dans le monde 2007: un avenir plus sûr: la sécurité sanitaire mondiale au XXI^e siècle .
- Pradhan, M., Sahn, D. E. and Younger, S. D. (2003). "Decomposing world health inequality". *Journal of Health Economics*, 22(2): 271–293.
- Ravallion, M. and Chen, S. 2003. "Measuring pro-poor growth". *Economics Letters*, 78(1): 93–99.
- Rawls, J. 1971. *A theory of justice*. Cambridge: Harvard University Press.
- Roemer, J. 1998. *Equality of opportunity*. Cambridge, MA: Harvard University Press.
- Roemer, J. E. 1998. *Theories of distributive justice*. Cambridge: Harvard University Press.
- Rosa Dias, P. 2010. *Essays on inequality of opportunity in health and human development*. University of York Department of Economics and Related Studies.

- Rosa Dias, P. and Jones, A. M. 2007. "Giving equality of opportunity a fair innings". *Health Economics* 16, 109–112.
- Sen, A. 2002. Why health equity? *Health Economics*, 11(8): 659–666.
- Strauss, J. and Thomas, D. 1995. Human resources: Empirical modeling of household and family decisions. *Handbook of development economics*, 3: 1883–2023.
- Thomas, D., Strauss, J. and Henriques, M. H. 1991. "How does mother's education affect child height?" *Journal of Human Resources*, 183–211.
- Tobin, J. 1970. "Money and income: Post Hoc Ergo Propter Hoc?" *Quarterly Journal of Economics*, 84(2): 301–317.
- Van Kippersluis, H., O'Donnell, O., Van Doorslaer, E. and Van Ourti, T. 2010. "Socioeconomic differences in health over the life cycle in an Egalitarian country". *Social Science and Medicine*, 70(3): 428–438.
- WHO (World Health Organization). 1995a. "An evaluation of infant growth: The use and interpretation of anthropometry in infants". *Bulletin of the World Health Organization*, 73, 165–174.
- WHO (World Health Organization). 1995b. *Physical status: The use and interpretation of anthropometry*. Report of WHO Expert Committee. WHO, Geneva.

Appendix

Appendix Table 1: Different types of opportunities

	Types
1	imediat oui sante_pub allait_plus non non sect_informel sect_formel non 1 electric moder_toilet eaupotabl secondaire Lome tres_riche 1882...
2	imediat non sante_pub allait_plus non non sect_informel sect_formel non 3 electric moder_toilet eaunon_proteg secondaire noeducation Lome riche 21...
3	1es_24heur_accouch non maison allait_plus oui oui sect_informel agriculteur non 7 pas_electric tradi_toilet eaunon_proteg secondaire noeducation S...
4	imediat non maison allait_plus non non sect_informel sect_formel non 5 pas_electric tradi_toilet eaupotabl secondaire primaire Plateaux moyen 2790...
5	des_jour_accouch non sante_pub allait_plus non non agriculteur agriculteur oui 5 pas_electric tradi_toilet eaupotabl primaire noeducation Kara tre...
6	imediat non maison allait_plus non non sect_informel sect_informel non 5 pas_electric tradi_toilet eaunon_proteg primaire Plateaux moyen ...
7	des_jour_accouch non sante_pub allait_plus non non sect_informel agriculteur non 7 pas_electric tradi_toilet eaunon_proteg noeducation noeducation...
8	1es_24heur_accouch non maison allait_plus oui non agriculteur agriculteur non 3 pas_electric tradi_toilet eaupotabl noeducation noeducation Savanes...
9	des_jour_accouch non sante_pub allait_plus non non agriculteur agriculteur non 2 pas_electric tradi_toilet eaupotabl noeducation noeducation Savan...
10	1es_24heur_accouch non sante_pub allait_plus oui non sect_informel sect_formel non 3 electric moder_toilet eaupotabl secondaire noeducation Lome ri...
11	imediat non sante_pub allait_plus non non sans_emploi agriculteur non 4 pas_electric tradi_toilet eaunon_proteg noeducation noeducation Savanes tr...
12	imediat non sante_pub allait_plus non non sect_informel sect_formel non 5 pas_electric tradi_toilet eaupotabl noeducation noeducation Maritime moy...
13	imediat non sante_prive allait_plus non non sect_informel sect_formel non 2 electric moder_toilet eaupotabl secondaire noeducation Maritime tres_r...
14	des_jour_accouch non sante_pub allait_plus non non agriculteur agriculteur non 5 pas_electric tradi_toilet eaupotabl noeducation primaire Kara pau...
15	des_jour_accouch non maison allait_plus oui non agriculteur agriculteur non 5 pas_electric tradi_toilet eaunon_proteg primaire noeducation Savanes...
16	imediat non sante_prive allait_plus non non sect_informel sect_formel oui 4 electric moder_toilet eaupotabl secondaire noeducation Lome tres_riche...
17	des_jour_accouch non maison allait_plus non non sect_informel agriculteur non 6 pas_electric tradi_toilet eaunon_proteg primaire noeducation Savan...
18	des_jour_accouch non sante_prive allait_plus non non sect_informel sect_formel non 3 electric moder_toilet eaupotabl secondaire Central...
19	imediat non sante_pub allait_plus non non agriculteur agriculteur non 4 pas_electric tradi_toilet eaupotabl secondaire primaire Plateaux moyen 235...
20	1es_24heur_accouch non maison allait_plus non non agriculteur agriculteur non 2 pas_electric tradi_toilet eaunon_proteg primaire noeducation Savane...
21	imediat non sante_pub allait_plus non non sect_informel agriculteur non 4 pas_electric tradi_toilet eaunon_proteg noeducation noeducation Savanes ...
22	des_jour_accouch non maison allait_plus oui non sect_informel agriculteur non 2 pas_electric tradi_toilet eaunon_proteg noeducation noeducation Ce...
23	des_jour_accouch non sante_pub allait_plus non non agriculteur agriculteur oui 4 pas_electric tradi_toilet eaupotabl primaire noeducation Savanes ...
24	imediat non sante_pub allait_plus non non sect_informel agriculteur non 5 pas_electric tradi_toilet eaupotabl primaire noeducation Savanes ...
25	des_jour_accouch non sante_pub allait_plus non non sect_informel agriculteur non 5 pas_electric tradi_toilet eaunon_proteg primaire noeducation Sa...
26	des_jour_accouch non sante_pub allait_plus non non sect_informel agriculteur non 5 pas_electric tradi_toilet eaupotabl noeducation noeducation Sav...

Appendix Table 3: Descriptive statistics on standardized height according to groups of opportunities (1998)

Subgroup summary statistics, for each sub-group $k = 1, \dots, K$:

RECODE of gp_opp	Popn. share	Mean	Relative mean	Income share	log(mean)
Opp_défavorable	0.39484	81.07374	0.99200	0.39168	4.39536
Opp_moyenne	0.57749	82.05149	1.00396	0.57978	4.40735
Opp_favorable	0.02767	84.29415	1.03141	0.02853	4.43431

Appendix Table 4: Descriptive statistics on standardized height according to groups of opportunities (2013)

Subgroup summary statistics, for each sub-group $k = 1, \dots, K$:

RECODE of gp_opp	Popn. share	Mean	Relative mean	Income share	log(mean)
Opp_défavorable	0.58697	81.75740	0.99441	0.58369	4.40376
Opp_moyenne	0.31945	82.62812	1.00500	0.32105	4.41435
Opp_favorable	0.09358	83.69454	1.01797	0.09526	4.42717

Appendix Table 5: Results of inequality of within and between groups opportunity (1998)

Within-group inequality, GE_W(a)				
All obs	GE(-1)	GE(0)	GE(1)	GE(2)
	0.00187	0.00187	0.00188	0.00189
Between-group inequality, GE_B(a):				
All obs	GE(-1)	GE(0)	GE(1)	GE(2)
	0.0003	0.0003	0.0003	0.0003

Appendix Table 6: Results of inequality of within and between groups opportunity (2013)

Within-group inequality, GE_W(a)				
All obs	GE(-1)	GE(0)	GE(1)	GE(2)
	0.00136	0.00136	0.00136	0.00136
Between-group inequality, GE_B(a):				
All obs	GE(-1)	GE(0)	GE(1)	GE(2)
	0.0003	0.0003	0.0003	0.0003

Appendix Table 7: Contribution of opportunity groups (1998)

Subgroup indices: GE_k(a) and Gini_k

RECODE of gp_opp	GE(-1)	GE(0)	GE(1)	GE(2)	Gini
Opp_défavorable	0.00218	0.00218	0.00218	0.00219	0.03684
Opp_moyenne	0.00216	0.00216	0.00217	0.00218	0.03644
Opp_favorable	0.00138	0.00138	0.00139	0.00139	0.02894

Appendix Table 8: Contribution of opportunity Groups (2013)

RECODE of gp_opp	GE(-1)	GE(0)	GE(1)	GE(2)	Gini
Opp_défavorable	0.00184	0.00183	0.00183	0.00184	0.03350
Opp_moyenne	0.00135	0.00136	0.00136	0.00136	0.02881
Opp_favorable	0.00129	0.00128	0.00128	0.00128	0.02810



Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

www.aercafrica.org

Learn More

- | | | | |
|--|--|---|--|
|  | www.facebook.com/aercafrica |  | www.instagram.com/aercafrica_official/ |
|  | twitter.com/aercafrica |  | www.linkedin.com/school/aercafrica/ |

Contact Us

African Economic Research Consortium
Consortium pour la Recherche Economique en Afrique
Middle East Bank Towers,
3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@ercafrica.org