LUND UNIVERSITY
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Master in Economic Development and Growth

Beyond income inequality in Ecuador: On decomposing socioeconomic-related child health inequalities.

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Abstract: The present thesis measures to what extent socioeconomic (SES) related child health inequalities exist in Ecuador, how has been its evolution in the last decade and which are the variables determining child health. In order to determine the SES-related child health inequalities a decomposition analysis is carried for the concentration index for two household surveys in 2004 and 2012. Results indicate that health inequalities have increased and that the SES gradient of health has worsened. The average improvement observed on health indicators is not evenly distributed. In addition, some groups such as indigenous and the poorest quintile have seen increased its malnutrition levels. The greater influence of wealth and other variables associated with higher SES in 2012 put evidence of a transition from the absolute (protective) effect of income on health, towards the relative hypothesis, where the rank or relative position in the SES distribution is what matters. Till 2004 health was more associated with access and supply constraints of health facilities, whereas in 2012 parent's education, wealth and the presence of health insurance are more important. The extent to what child health inequalities has worsened, make it predictable that income inequality will be persistent in the future, provided the causal mechanism that recent literature have put on child health in future labor status and educational attainment.

Key words: Inequality, Child health, concentration index, decomposition analysis, Ecuador.

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1. Introduction.

Several documents of international organizations have put inequality on the center of debate. Since the World Development Report 2006 (World Bank, 2006) and its previous report focused on Latin America (World Bank, 2005), the discussion about the effects of inequality over the economy has returned. Those documents postulate that equity should be an objective of development, but even more important is the fact that generating equal economic opportunities and policies towards a more balanced economic and political environment is fundamental for economic growth. In that sense, institutions are basic, particularly in a region characterized for severe inequalities, such as Latin America. The message suggests putting particular emphasis in promoting a more efficient government, with progressive expenditure, that stimulates equal access to productive assets, particularly the capability of generating human capital due to its long-lasting effects over growth.

The same argument is given by the United Nations Development Program (UNDP, 2010) report on Latin America Human Development, where the necessity of breaking the intergenerational transmission of inequality, present in the region in the form of low labor, income and educational mobility turns to be the basic idea, sustained by the concept of "effective freedom". The Economic Commission for Latin America and the Caribbean (ECLAC) supports the same idea when in its report on "Structural Change for Equity" (ECLAC, 2010) it argues that the growth pattern in Latin America in the next years must go towards structural change that favors equality, understanding the need to increase labor productivity, improve the quality of labor and generate capabilities among the population to link equity, growth and deepening of democracy. The growth agenda should not be contrary to the equity agenda according to that institution. This vision finds historical support in some of the so-called Asian tigers, particularly the eastern countries (Taiwan, Japan, and South Korea). Growth with equity would be a specific type of economic growth, as the one experienced in that region, perhaps this evidence indicate that equity is an agent of growth, that is, growth because of equity (Andersson and Gunnarsson, 2003, p. 144). As these authors mentioned *"(…) egalitarianism comprises a cumulative dynamic of inclusiveness of market institutions, growth and social stability through equal access to rights and opportunities".*

However, little has been written about the causes that promote persistent inequality. If it is assumed as true the idea of inequality traps posted by Ferreira and Bourguignon (2007), also present in the World Development Report (2006), then there might be some structural conditions persistently affecting certain groups in the society that also prevent a more efficient equilibrium in the economy, reducing overall productivity and therefore economic growth.

It is widely known since the Human Capital theory (Becker, 1964) that income (and labor) outcomes depend on schooling (after controlling for another series of covariates), giving the conclusion that in order to break a persistent situation of income inequality it is required to promote a more egalitarian access to quantity and quality of education, also because it is essential to break poverty traps that exist when individuals cannot accumulate (exogenous or endogenously) non-divisible assets seen as long-term investments, such as education (Galor and Zeira, 2000; Cunha and Heckman, 2010). However, given the fact that education is an exogenous decision for the individual, at least in the very early stages of life, the fact of acquiring education is an intergenerational problem.

The recent literature on transmission of human capital and intergenerational mobility has put health as the channel of causality between income when adult and educational attainment, where childhood health is an important mechanism of transmission of education and economic status (Currie, 2009, Almond and Currie, 2010, Case and Paxson, 2010). This literature has found strong evidence to suggest that health conditions in the very early stages of life are highly correlated with future income, labor outcomes and socioeconomic status (SES). In addition, parent's background, in the form of mother's and father's educational level, social class and health status at the moment of the child birth are important conditions to explain the variation in children health.

Given these findings, it could be possible to state that provided there is deep health inequality at childhood, *ceteris paribus*, one would expect persistent income inequality in the future. In addition, the extent to which socioeconomic status is passed through generations by means of child health, this condition violates norms of equal opportunity, given the fact of the exogeneity of early life conditions for children. When interactions between income and health are important, the distribution of income will depend on the level and distribution of health (Deaton, 2003). Any measure that reduces the spread of

health conditions across the population, or improves the health environment, will narrow the distribution of income.

In that sense, not only human capital accumulation in the form of education, but particularly by promoting child development focused on child health across different groups, sectors and individuals of the population might be a cost-effective way of breaking inequality traps and boosting human capital accumulation that then will allow to achieve better equality of outcomes in the future.

Little research has been done for measuring child health inequalities in Latin America. Most of that literature is focused on child mortality. However, given the important improvements in this indicator across the region and within countries, it is desirable to extend the variables of analysis and assess to what extent the improvements are evenly distributed, as well as to take other determinants of health further than mortality. This indicator is strongly related to initial stages of the epidemiological transition, a situation that is widely overcome in LA. In that sense, malnutrition appears to be a more pertinent indicator of health to be analyzed.

In those lines, the present thesis attempts to contribute to this strand of literature by measuring i) to what extent child health inequalities are present in Ecuador, ii) how has been its evolution in the last decade and iii) which are the determinants and drivers of a change in health inequalities. If health conditions at childhood are severely unequal, and this situation is persistent on time, this is a first clue of an inequality trap that would not help future generations to experience a more evenly distributed income. In order to carry out those computations, it is used microdata from two household surveys, the Maternal and Child Health Survey of 2004 (ENDEMAIN 2004) and the National Survey of Health and Nutrition 2012 (ENSANUT 2012). The use of these two surveys comes with the advantage of enabling to compare child health status during different economic contexts. At the mids 2000 Ecuador had been receiving the yields of a decade of structural reforms and economic liberalization (including the health sector), while in 2012 it would be possible to observe whether or not the great boost in social investment that have taken place since 2007 by the government is somewhat reflected in more egalitarian outcomes in child health.

The empirical strategy is to measure child malnutrition through the z-score of height-to-age standardized with the new 2006 standards of growth issued by the World Health Organization (2006) for children younger than 60 months. First of all, it is computed the concentration index of malnutrition and is assessed the change of overall SES-related health inequality across the whole distribution of socioeconomic status between 2004 and 2012 using dominance criteria. In order to compute this, a comparable measure of socioeconomic status is created by an index of wealth that comes from the asset holdings of the household. Second of all, it will be used a regression framework to analyze the correlation of malnutrition with a series of covariates. The concentration index is later decomposed to observe how the elasticities of child malnutrition determinants have evolved between the same periods.

Results indicate that SES-related child health inequality has worsened between 2004 and 2012 basically due to higher levels of malnutrition amongst the poorer. This is a somewhat unexpected result given the important investments in social development that has been taking place since 2007 (where health has been a basic destiny of resources). In spite of an overall decrease in the prevalence of stunting in the population, the gainers of this situation have been disproportionally the better-off individuals. Besides, malnutrition has deteriorated for the poorest quintile and indigenous people, while upgraded for the rest of quintiles and Afroecuadorians (both compared to mestizos/whites). This has also caused that the average level of malnutrition adjusted by inequality (the achievement index) has become more sensitive to the degree of inequality aversion in 2012 compared to 2004.

The weak relation of malnutrition to the SES-gradient in 2004 is confirmed when 84% of the Concentration index in that year is explained by demographic variables, while in 2012, a year where SES highly affects malnutrition through wealth, parent's education and access to a health insurance explains almost 100% of the Concentration index. It is believed that the changes in health inequalities in Ecuador in the recent years is moving from the absolute income hypothesis where the protective effect of income is determinant towards the relative hypothesis, where the rank and relative position in the SES distributions is more important to health. Nevertheless, provided the fact that not only SES but also race is exogenous conditions for children, it is concluded that equality, seen from the opportunities standpoint, has also decreased. The deepening in the SES-health relationship between 2004 and 2012 in terms of child health is a first clue of an inequality

trap, a topic that deserves future research, and that make it expected that the structural income inequality will be persistent in the future. Furthermore, future research should also tackle more directly the weak effect the subsidies and investments are having in health of the poor.

The present paper is organized as follows. Section II describes the context and country profile in terms of health that motivates the present thesis. Section III defines the theoretical framework and the literature review. Section IV shows the method and section V describes the data. Section VI present and discuss the results. Section VII concludes.

2. Why is it worthy to analyze inequality in Ecuador? The context.

Ecuador is a middle income country with a per capita income in 2011 of USD 8,510 PPA-adjusted, which is equivalent to 71.2%[1] of the Latin America and the Caribbean (LAC) average. As part of the most unequal region in the world, Ecuador has been a society historically characterized by deep social, ethnic and regional inequalities. This situation has not been changed in spite of a set of different institutional modifications the region has experienced in its last twenty years of economic history; variations driven by the application of structural adjustment and liberalization programs till the early 2000s to a more recent turn since categorized as a departure from the previous orthodox policies.

The 1990s in Ecuador are identified by reforms of the kind promoted by the Washington consensus. Trade and financial sectors were liberalized. The liberalization policies strengthened export growth, especially of more capital-intensive activities (oil, primary manufacturing, and traditional export-led agriculture), though some of the effect was counteracted by the stabilization policies. The adjustment policies and market reforms failed to induce strong employment growth in the modern sector. The jobs that were created in the formal economy mainly benefited skilled workers avoiding the generation of a strict pro-poor growth[2]. On balance, poverty in absolute terms remained stable and high, and inequality increased during the 90s (Vos Rob, 2000)[3]. The reason is that despite the

[1] Current prices in dollars by each habitant. Info on the Economic Commission for Latin America and the Caribbean (ECLAC), available on:
http://websie.eclac.cl/sisgen/ConsultaIntegrada.asp?idAplicacion=6&idTema=131&idioma=e

[2] Defined as a higher-than-average income growth amongst the lower quintiles.

[3] Furthermore, many studies evaluating the results of reforms and structural adjustment have indicated that, at least, the short term impact of those changes had a few impact on growth and poverty reduction in spite of the

increase in average income, the process of openness and liberalization did not caused a surge in demand of the Ecuadorian relative abundant factor (e.g. unskilled labor force).

The weak influences mitigating poverty disappeared in the second half of the 1990s when the impact of the macroeconomic stabilization policies faded and the management of the exchange rate collapsed, increasing inflation and destabilizing the political regime.[4] The economic downturn pushed more workers into unemployment and underemployment (Ponce, J. et.al. 2010). That accrued in higher poverty and income inequality, generating a lost decade in terms of social progress.

The aftermath of that situation was the instauration of full dollarization in 2000. Dollarization brought a period of low inflation and macroeconomic stability that helped to boost real salaries and sustained growth. Further, since 2000 not only oil, which is still the main export, but also prices of many other primary products that Ecuador exports have been increasing continuously in the world market, favoring terms of trade, fostering growth and boosting liquidity within the economy. Finally, increased government revenue thanks to higher oil revenues supported a recovery of government spending.[5]

Nevertheless, what concerns is the fact that poverty reduction during much of the previous decade was not associated neither to structural transformations directed to generate formal employment and reduce inequality nor to a comprehensive social policy to generate equal opportunities amongst the population. In fact, it basically comes from exogenous factors (CISMIL, 2008)[6]. In an prospective evaluation to infer whether or not Ecuador will be able to accomplish the Millennium Development Goals (MDG) in terms of poverty reduction, the CISMIL (2008, p. 51) argue that with an optimistic scenario of economic growth, it would also be required to reduce inequality in at least 0.3 percentage points, which could increase to 3 points depending on the overall economic performance.

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huge increase in exports and capital inflows during that time, as well as had increased inequality and social tension within the countries (Escaith and Morely, 2001; Fernández-Arias and Montiel, 1997; Correa, 2002).

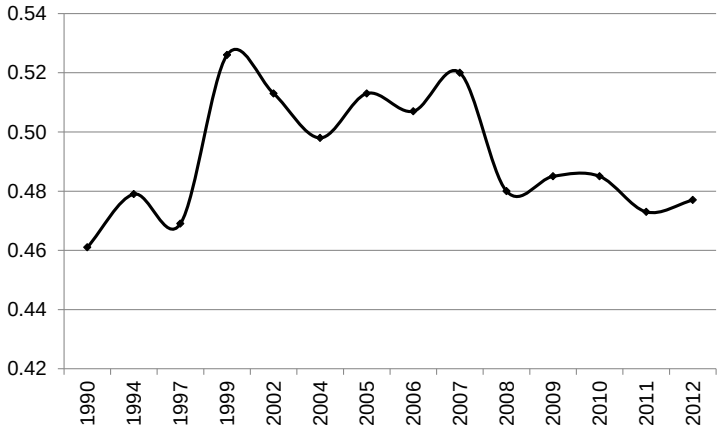
[4] This was reinforced by the arrival of unfavorable external shocks: a strong natural disaster, the collapse of oil prices, and the international financial crisis started in the southeast Asia in 1997. All these events put the economy into a tailspin leading towards a full-blown banking and currency crisis in 1999.

[5] As a result of this outlook, during the last decade employment levels and real wages rebounded, for unskilled workers included, pushing the incidence of absolute poverty down to 27.3% in 2012 (INEC, 2012).

[6] In 2005, poverty and inequality levels were basically the same of those at 1995.

Graph. No. 1

Income inequality in Ecuador. Gini index 1990-2012.



Source: ECLAC and INEC

Note: The serie is not continuous. Before 2004 information about income inequality is available only for some years.

This situation, very common among LAC countries, brought with the fact that the benefits of economic growth in the last decades have not been evenly distributed. Poverty and inequality traps were somehow perpetuated for some segments of the population. For instance, the RIMISP (2012, p. 17) calculated that among several LAC countries 32% of municipalities where 24% of the population live have experienced growth with poverty reduction, but only 13% of municipalities, where 10% of the population live have experienced growth with inequality reduction. In a region with very high levels of income disparities the situation is challenging and worrying.

Therefore, in order to keep reducing poverty in Ecuador, inclusive growth is not a sufficient condition, but necessary. However, that implies to create path breaking policies in terms of income inequality, for which it is essential to boost human capital accumulation in a dynamic perspective, focusing on health and education, particularly for the poorer.

That is one of the motivations of the present research. In Ecuador, as in the region, there has recently been a change towards a greater government participation in the provision and guarantee of public goods. The public investment in health and education has augmented intensively coupled with a social concern to reduce inequality. This proposal tries to enlarge the capabilities of the population, the inclusion of groups traditionally excluded and promote economic growth in the medium term. The focus of this thesis is to analyze the impact in terms of health, giving that recent literature argues that

health conditions while being a child is the causal mechanism of intergenerational transmission of human capital.

2.1. Health in Ecuador

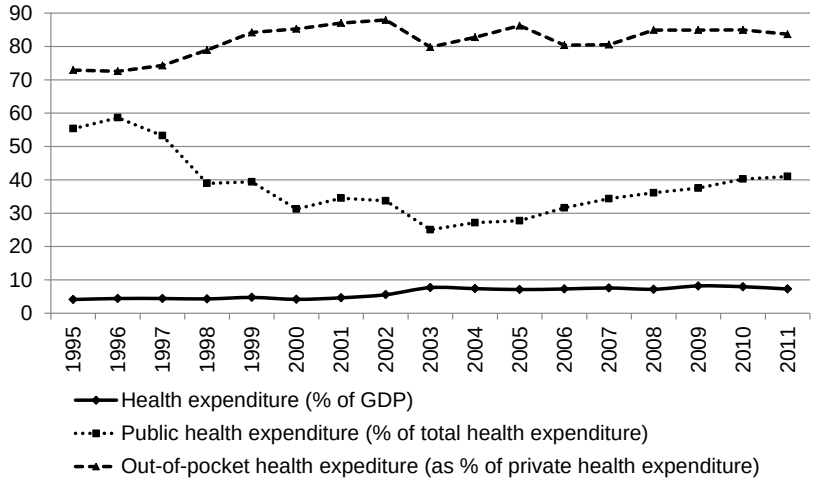
The evolution of health conditions in Ecuador has been positive along the country economic growth process. Since the creation of the Social Insurance Medical Service in 1935, the health system has evolved up to conceive the Health Universal Insurance Program in 2006 or the consolidation in 2009 of the Integral Net of Public Health, thanks to the inclusion of the concept in the new Ecuadorian Constitution of 2008. This system is basically formed by two sectors: public and private. The former integrated by different governmental institutions and the system of social security, while the latter is composed by for-profit entities (hospitals, clinics, pharmacies, among others) and non-for-profit organizations. The public system funded by the national government is of free access for the whole population, however, it basically attends the poorer segments of the population, people without the capacity to afford prepaid medical services, private insurance or private medical services. The social security system and the private sector are directed towards the richer quintiles of the population and formal workers.

In general terms, some macro indicators of the health situation in Ecuador show an improvement; for instance, the health expenditure as a share of GDP has risen from 4.1% in 1995 to 7.3% in 2011. The per capita health expenditure surged from USD 72.9 in 1995 to USD 331.51 in 2011 and the public health expenditure as a share of total health expenditure has moved from 55.4% in 1995 to 41% in 2011.[7] It is also noteworthy that in addition of being the main source of health expenditure, the private health expenses are mainly out-of-pocket (OHE), that is, expenses the households have to incur to solve their medical requirements (drugs, medical attention, among others). This indicator has raised from 72.9% of total private health expenses in 1995 to 83.7% in 2011, meaning that budget constraints could be an important limitation to the poorer segments of the population to have access to proper health services.

[7] Nevertheless, these indicators are still below the Latin America and the Caribbean (LAC) levels. For instance, in 2011 the health expenditure as a share of GDP was 7.6%, the public health expenditure as the total health expenditure represented 50.3% and the average per capita health expenditure was USD 730. The share of public expenditure as a share of total health expenditure in Ecuador, although showing a decrease, since 2000, when it was 31.3%, it has been rising (World Bank, 2012).

Graph. No. 2

Health expenditure indicators in Ecuador (1995-2011)



Source: World Bank data

Furthermore, regarding the relative importance of health expenditure within household budgets, it represents on average 4% of total household income, and 7.4% of the total disposable income, after covering subsistence needs (Perticara, 2008, pp. 20-21). Those numbers are still low compared to LAC averages. According to Perticara (2008), this could be either because people that requires emerging health services could go to the free public services or because the lower quintiles of the population simply cannot afford those demands and do not take this extra expenses. Besides, only 44.2% of the population has a complementary medical insurance (including the social insurance system), and among the households that have a complementary insurance, only 8.3% of the cases has a contract covering all the members, including children. This means that there is not only an unequal distribution of medical insurance at an aggregate level in the country, but also within the households (Perticara, 2008, p.21).

This unequal access to health care services is also related to infrastructure accessibility. According to data of 2010, the free public service provided by the national government accounts for 47% of the total health services and cover around 51% of the

Ecuadorian population and the social insurance system covers 25% (Lucio, 2011, p. 6).[8] In that sense, even though the law establishes the health universal coverage, in fact it still persist a limited supply and the quality varies tremendously depending on the area, region and sector that offers it. For instance, in spite of being the public sector the one that has 80% of the health infrastructure, 75% of the internment supply comes from the private sector, which appear to be an important access constraint to the poor, or people living in rural areas. Besides, the regional disparities in the health care services are also noteworthy; e.g. the ratio of doctors per 1,000 inhabitants could vary between 2 in the richest province to 0.56 in the poorest (Lucio, 2011, p.7).

To end it up, in spite of presenting a sustained development, the health system in Ecuador is still facing some challenges. First of all, there are huge regional disparities. Second of all, despite being the sector that attends the most, the public health services lacks infrastructure that limits the access to the population, particular the one with lower income. Third, it worries the fact that the out-of-pocket expenditure is raising as a share of total private expenditure, which could mean that the population is still not enough insured and that the poorer individuals are still more vulnerable. It is important to mention that the institutions governing the social protection system in Ecuador, and particularly health, is the result of two decades of liberalization, where the role of the policy where diminished to let the government provide minimum services, this strategy lacked a broader perspective to generate equal opportunities for the population that guarantees the exercise of rights and to develop capacities.[9]

2.1.1. Child health in Ecuador

As it was seen, the health care system in Ecuador was historically developed without enough coordination among the agents, which became in the absence of a comprehensive social protection system. In addition, there was not an integral public policy to take care of children that align objectives and budgets. For instance, the social insurance system did not include the family members of the covered individual, the percentage of households

[8] The Social Insurance System is integrated by the General Mandatory Social Insurance (IESS), the insurance designed for the military forces and their family (ISSFA), and a very similar type of system for the policemen (ISSPOL).

[9] Nevertheless, some initiatives have been taken in the last years to try to equalize the access to health care and level up the field for the population, especially for the vulnerable. For instance, in 2007 it was implemented as a regular program the Free Maternity Law, which exists since 1998 but vaguely applied, and the Catastrophic Illness Coverage Program aimed to finance all the expenses related to treatment of highly cost diseases to poorer population. Additionally, in 2003 it was modified the biggest cash transfer program to the poor to involve health checks for children and mothers, and since 2008 this program was extended.

with complete health coverage for all the members is very small, and the health system did not have a specific mechanism to systematically protect the health of the poor children.

Nevertheless, this does not mean there has not existed a public policy for the children, but uncoordinated. In the late 90s and the beginning of the last decade, the children protection systems was formed by several institutions (e.g. the Children Rescue Operation (ORI), the Children Development Fund (FODI) and the Integral Care for the Adolescence and Children (AINA)), none of which were part of a unique policy or unique evaluation system, and many of the projects were delegated to the private initiative through competitive funds gave by the FODI (SIISE, 2007). This complex institutional framework brought chaos in the system and most of the time gave the population overlapped services. This was the reason that motivated the fusion of all these services into the new Institute for Children and the Family (INFA) in 2008.

Additionally, there are three nutrition programs attending children: the Program for fighting hunger and malnutrition (PANN 2000) attending pregnant mothers and children up to 35 months of age and giving supplements and micronutrients; the program “Feeding Ecuador”, and “School Feeding” (PAE), both aim at giving nutritional education and delivering breakfast and lunch through public schools in the poorest areas of the country. On par with this situation, in 2003 the biggest direct subsidy (cash transfer) to the poor was transformed into a conditional cash transfer program named Human Development Bond (BDH). The BDH was extended to tackle structural poverty through human capital accumulation by forcing the beneficiary individuals to send their children to school and to periodic health checks.

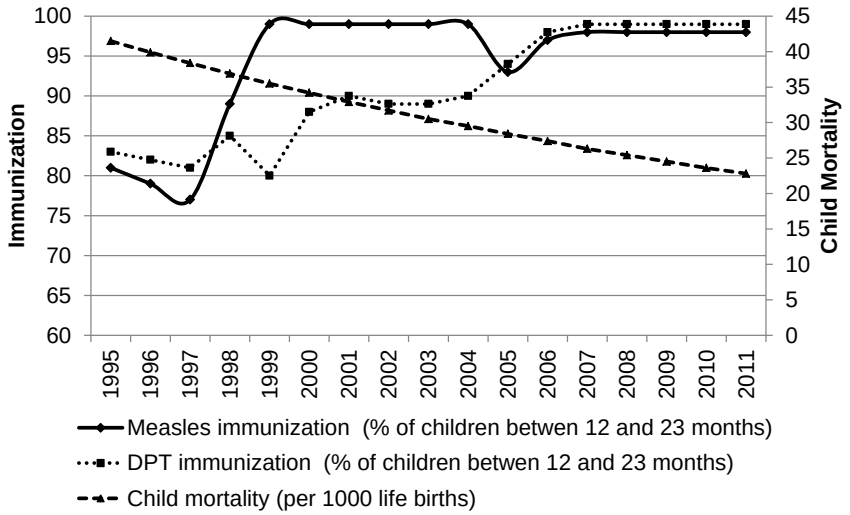
In that sense, the BDH turned into the most important social protection program in Ecuador, covering approximately 45% of the Ecuadorian Households and meaning about 11% of the social expenditure of the Government in the year of its creation (Dobronsky and Rosero, 2007, p.6). Related with child development, this program had as one of its objectives to contribute with the decrease of chronic malnutrition and preventable-immune diseases as well as to increase the scholar registration and permanence in the educational system and reduce child work. According to many studies, this program has had positive impacts in terms of human capital, reducing child work, increasing the registration in education, and improving some health indicators such as hemoglobin level and motor control (Dobronsky and Rosero, 2007, Schady and Araujo, 2006, Ponce and Bedi, 2010,

Paxson and Schady, 2007). These outcomes might have great results in boosting and equalizing early child development in Ecuador.

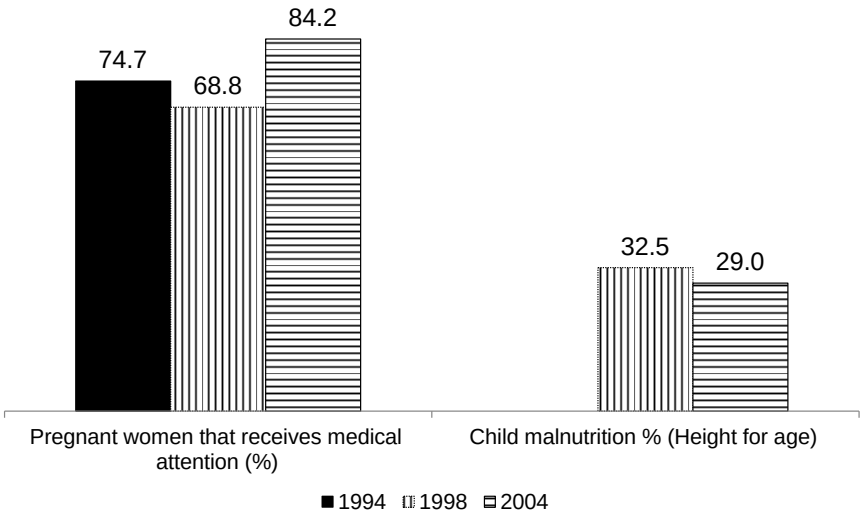
The results of the institutions and the strategy presented before are reflected in graphs no. 2 and 3 below. As it could be seen, child mortality has decreased systematically in the last two decades, reaching a value of 22.8 children per 1000 live births; basic immunization is almost universal, pregnancy attention received by mothers is constantly increasing and child malnutrition is decreasing.[10] However, it is noteworthy the fact of the great regional disparities these indicators present. For instance, regarding child mortality more than 50% of the population still lives in provinces with negative gaps with respect to national averages (RIMISP, 2001b).

Graph No. 3

Child health indicators. Different periods (1995-2011)



[10] Immunization rates in Ecuador are higher-than-LAC average levels. DPT immunization in LAC is 91.6%, Measles immunization is 93.1% whereas in Ecuador both are close to 99%. The rest of child health indicators are worse. Child mortality is higher than LAC levels (19.1 children per 1000 live births), pregnant maternal prenatal care is lower (96.2%) and child malnutrition is almost double in a comparable year (14.3% in 2005).



Source: World Bank data

Despite the overall health improvement in Ecuador, none of these indicators provide us a picture of how equally distributed are these achievements. Moreover, nothing has been written about whether or not the improvements come from overall increase in health indicators, inequality reduction, or both. Reducing that information gap is one of the expected outcomes of the present paper.

3. Theoretical framework

3.1. The role of inequality on economic performance

Since the seminal work of Kuznets (1966), inequality has been widely studied. Kuznets argued that the level of income of a country affects income distribution, arguing that income inequality rises along the process of development of a country till a certain threshold when it starts to decrease. He argues that this is a “natural” process coming from differences amongst the gainers of productivity increases, usually favoring the high-skilled agents. Nevertheless, most of the literature has focused on analyzing the other way in this relationship, namely the impact of inequality on economic growth, with diverse results.

One perspective establishes that if the richer have a higher propensity to save and invest, then inequality might boost economic growth through a more rapid capital accumulation (Kaldor, 1961; Galor and Tsiddon, 1997). On the other hand, some literature has argued that inequality may be harmful for growth. The channel of affection would be that greater inequality prevents a large share of population from productive investment,

particularly when the economy has imperfect capital markets, reducing the potential growth and perpetuating this segment of the population into low levels of income (poverty traps) (Galor and Zeira, 1993). Beyond that, it could be the case that high inequality may lead the poorer median voter in favor of distortionary taxation due to the higher concern about distributional conflicts (Persson and Tabellini, 1994); these conditions reduce efficiency and thus would slow economic growth. Those different results are also found empirically.

Nevertheless, the consensus among this literature appeared to be that economic growth, reflected as the increase in average income, is uncorrelated with inequality measures on average. That means that the poor would benefit from growth the same as the rich, hence economic growth is good for the poor even facing a distributional-neutral rise in average income (Dollar and Kraay, 2000). Nevertheless, despite the potential null effect of growth on inequality, evidence did find arguments establishing that the poverty elasticity of growth is higher in environments of lower inequality (Ravallion, 2001, Knowles, 2001), meaning that more equal societies experience a more inclusive, pro-poor growth.

Further considerations are necessary when it comes to the intertemporal effects of initial distributional conditions on policy reform or in capital accumulation on the lights of the endogenous growth theory. This is especially notable when it comes to asset inequality and its effects on growth-promoting opportunities for investments in human capital (Galor and Zeira, 1993, Aghion et al., 1999).

This idea of recursion between asset inequality and growth particularly connected with long-term investments such as human capital is closed to what has been discussed in the last decade related to inequality of opportunities. Health and education could be seen as assets of an individual and their impact on inequality and growth have the same relation as of any other long-term investment decision. If inequality is transmitted through generations by means of human capital transmission, then the circumstance of an individual today is linked to that of previous generations. This generates persistent differences in opportunities since the very beginning of life that might be reflected in differences in future outcomes. If this is true, this violates postulates of the literature on

equality of opportunities because disparities are coming from differences in features beyond the control of the individual, i.e. inherited, predetermined circumstances.[11]

Furthermore, what is particularly problematic in the presence of persistent inequality of opportunities is the possibility of inequality traps to arise. An inequality trap, defined by Bourguignon and Ferreira (2007, p.9), is a *"…long-run distribution of a certain outcome in which a particular social group, defined as a group with fixed particular circumstances, does persistently worse than some other group, although other equilibrium exists where no two social groups can be ranked equally".* In that sense, inequality traps contribute to the persistence of unequal opportunities and reinforce each other, and may have efficiency costs in aggregate terms. Besides, to the extent inequality of opportunities contribute to a higher outcome inequality, as it was seen, it would also reduce the growth elasticity of poverty. This is the spirit behind the message in the World Bank's World Development Report 2006[12] that clearly motivates for the pursuing of equitable development policies (World Bank, 2006) to foster growth. Stimulating a more equity society seems not only ethically desirable but also a "good business".

However, promoting these equitable policies is not straightforward. According to the human capital theory and the recent contributions of the literature on intergenerational transmission of human capital, income is a function of how prepared and skilled the individual is. Nevertheless, it seems as a theoretical consensus the fact that health, particularly health and living conditions at the very early stages of life to be the main channel of intergenerational human capital transmission, affecting future educational attainment, and therefore prospect labor status and income. Child health and very early life conditions would be the drivers that might break the impossibility of carrying out long-term investments in human capital (Currie, 2010, Case and Paxson, 2010, Almond and Currie, 2010, Cunha and Heckman, 2010, Cunha et.al, 2010, Heckman, 2007).

Following this literature, it could be argued that provided the case there are widespread inequalities in health and health care among children, therefore the society is embodying to future generations inequality in outcomes such as educational attainment,

[11] Inequalities that rise from market rewards to personal effort and responsibility would not be ethically questionable (Roemer, 1988). Also, following Bourguignon et al. (2007) and Marrero and Rodriguez (2010), inequality of effort promotes economic growth (via incentives for hard work and savings) whereas inequality of opportunity hinders it (via reduced opportunities for education and investment for the majority of the population).

[12] And many other, as it was stated in the introduction.

labor market participation and income. Hence, when it comes to future income inequality, the presence of health inequalities among children is of great importance. In that sense, generating the equitable development policies focus on child health turns out to be a mandatory condition to achieve a more evenly distributed income in the future and also to boost and sustained economic growth.

3.2. Inequalities in health.

As it was seen, the recent literature have put health as the key variable in driving intergenerational human capital accumulation, so lower level of health inequalities would be associated with more balanced human capital accumulation in a society. Nevertheless, health is one edge of well-being that is obviously unequally distributed across the population, and not all of those health inequalities are inequitable on their own. There are several determinants of health that are beyond the scope of policy interventions, such as age, that highlights the fact that if health inequalities have changed due to variations in the age composition within or across some population, little could be seen as inequity. The same argument applies when health is related to lifestyle choices or preferences. This argument implies that evaluating health inequalities require at least two considerations. First, analyze which conditions explain the observed health inequalities, and second, take a normative position to evaluate whether or not those determinants are unfair. In a strict point of view, inequality and inequity are not the same phenomenon (Fleurbaey and Schokkaert, 2012).

According to the standard lifecycle human capital model that explains child health production (Grossman, 2000), parents maximize an intertemporal utility function in which child health is one of its arguments and is viewed as part of the bequests to give their children. Following Currie (2009), the model has several insights. First of all, the budget constraint will be less binding in wealthier families, and these families will be able to purchase more or better health inputs. Additionally, richer families have better conditions to decide their choices about health care and health habits. The socioeconomic status could be reflected as different level of knowledge or preferences about health, which are known as taste drivers in the determinants of child health production. Besides, parent's education plays an important role because it is seen as a household productivity driver,

which in turn affects time allocation to health care and time devoted to children[13]. Additionally, children with lower socioeconomic status (SES) are likely to have lower health capital at birth ("the fetal origins hypothesis"). If it is assumed that fetal conditions are related to children risk and then to the prevalence of morbidity at adulthood, thus children with lower SES may also experience worse health at adulthood.

The heritage of the Grossman model is related with at least three hypotheses about how income inequality affects health. The first one is the one that focus on the implications of diminishing marginal health benefits from increases in individual income. The second is the one that explains the effects on health of relative deprivation, and the last one focuses on the society-wide effects of income inequality on health through violence or public spending on health (Leigh, A. et al., 2009). These theories also have found two basic mechanisms through which the relationship is transmitted: labor market and education.

The theory arguing the diminishing marginal health benefits of income is what is sometimes referred as the absolute income hypothesis, which establishes that income matters for health, not income relative to others, that is, not income inequality. This is what Deaton (2003) called the poverty hypothesis, namely health is a result of low income, ergo, health is more sensitive to income among the poorer than those with high income. Health must be a concave function of income. The existence of this concave relationship is known in the literature as a statistical artifact (Gravelle, 1998) suggesting that this is only a stylized fact but lacks of indicating a direct effect of income inequality on health. However, Deaton (2003, p.7) is contrary to that argument indicating that *"if income causes health, and if there are diminishing returns, redistribution from rich to poor will improve average population health"*, or the average health in the society will improve when the average income increases and inequality decreases (Wagstaff and van Doorslaer, 2000). As a result of this strand of literature, the need to extend the influence of several markers of socioeconomic status on health has aroused. At the end, income is only one marker of well-being, so it is also analyzed the effect of wealth, consumption, occupational class, education, race, geography or even the rank in a distribution of SES within a population on health.

[13] Productivity drivers are viewed as determinants of time allocation in every intertemporal production model.

The other argument supporting the relationship between health and income is the relative hypothesis. The idea is that not the absolute but relative income could determine access to material goods and the quality of these goods. In that sense, health depends on the deviation of the individual's income to the population mean (Wagstaff and van Doorslaer, 2000). Yet this is not far away from the interpretations of the Grossman model. Health determinants such as risk or access to certain facilities are more related to the rank on income distribution rather than absolute income. The relatively poorer are more exposed to worse conditions such as pollution, lower quality of housing or inferior infrastructure (Wilkinson, 1989; Marmot et al., 2000). The idea is that if health is lower for those whose income is relatively low, then higher inequality makes the poor even poorer in relative terms, and so worsens population health (Deaton, 2003, p.12). This standpoint basically stipulates a monotone increasing nonlinear relationship between income and health, and there might be associated inequality effects over aggregated groups. Nevertheless, a drawback on this view is that if the relative position is what matters for health, higher income or SES for everybody will have no effect on anyone's health. Due to this reason, is now argued that the relative hypothesis applies for countries with middle to high income levels, where inequalities are more important in determining health disparities, whilst the protective effect of absolute income is more relevant in poorer countries (Leigh, A., et al., 2009).

The conclusion of this theory is that, provided the groups across the health-income gradient is compared, a) within groups, health is a concave increasing function of income, b) conditional on the individuals rank within a group, inequality is not important for individual health, and c) across groups, the average level of health depends positively on group average income and negatively with group income inequality (Deaton, 2003).

Beyond these theories, up to now, the applied literature on health economics and health inequalities has focused on measuring the influence of some certain characteristics (income, SES, race, gender) on some variable that indicates the level of health. This is clearly a partial approach whose advantage is to be less demanding in terms of the data required than a more multidimensional analysis. Besides, usually socioeconomic-related inequalities are of particular interest amongst policy makers. Measuring inequality in the health sector has at least two basic standpoints: measuring health inequalities or health care inequalities. The indicators to measure health inequalities basically use morbidity, illness or mortality data as the health indicator, while the measurement of health care

inequality incorporates concepts such as needs, access and effectiveness (Schneider, M., Castillo-Salgado, C., Bacallao, E. et al., 2002). The present thesis restricted the analysis to health inequalities.

The literature also mentions that measuring SES-related health inequalities could also be dependent on the SES selected variable (Deaton, 2003, Currie, 2009). In that sense, it is of basic importance to define which side of the SES-health relation is one interested in. Besides, most of the options depend on the primary source of data that is used. Generally, individuals could be ranked in terms of labor status, income, consumption or wealth. Each indicator have its own advantages and drawbacks and measure different sides of material well-being, however all of them are certainly correlated. Nevertheless, it is an empirical finding that results are variable-dependent (O'Donnell et al, 2008).

It is also important to note that the debate around health inequality is affected by several ethical and instrumental deliberations. Beyond the instrumental position of whether absolute or relative income inequalities affects health directly, or if it is indirectly to public spending and health provision, when it comes to health inequality several caveats arise. First, health is only one side of a multidimensional phenomenon of well-being, even assuming its relevant role in a dynamic perspective of human capital accumulation. Second, most of the common indicators to measure health inequality do not truly assessed inequities. Traditionally, health indicators exclude preferences and personal decisions that must be incorporated in the analysis to make ordinal comparisons of health (Fleurbaey and Trannoy, 2003). Third, measuring health inequalities always imply the ethical position that one needs to do to consider a situation as desirable for everyone. For example, when measuring disparities associated with height one needs to assume that always the taller the better. Finally, another weakness is the fact of having to select particular weighting approaches when comparing distributions or groups and their health differences. Fleurbaey and Schokkaert (2012) highlights this caveat when it comes to establish whether a health improvement of a poorer individual is seen as better than when a richer individual improves, or only if the average health has improved without changes in inequality.

3.3. Previous research

The recent literature in health inequalities has accepted the plausible disparities in health and has tried to estimate elasticities, contributions or the correlation of different

tentative explanatory variables in explaining those differences. Yet most of this research, at least in developing economies, has tried to gauge to what extent SES influence health through racial or regional disparities on some health achievements. The particular structural conditions of poverty and deprivation related with indigenous people in Latin America, who also lives at rural area, or are low-skilled individuals have put more interest on assessing how these conditions are related with health disparities.

Larrea and Freire (2002) estimate the concentration index of the prevalence of stunting for four Andean using data for the 90s. They used information on housing, educational and labor characteristics of the households to create an index of wealth and used it as their measure of SES. Their results show higher prevalence of malnutrition in highland areas, particularly among indigenous populations and strong socioeconomic disparities. The socioeconomic gradient of stunting was strong in the four countries, with prevalence rates in the poorest deciles at least three times as high as those in the top decile.

Similar results were found by Bernal and Cardenas (2005) in a study applied to Colombia. However, they followed a completely different strategy and estimated the probability of being stunted, wasted or underweight depending on ethnicity and place of residence. Their results show that minorities, in spite of being systematically worse in terms of access to health care and health outcomes, are not significant at the moment of evaluate health disparities. The ethnicity is not statistically significant once the regressions are controlled for a series of socioeconomic characteristics and geographic conditions. That suggests that the racial and ethnic disparities in access to health care can be fully accounted by the fact that minorities are worse off in almost every single socioeconomic dimension. The same conclusion applies when analyzing self-reported health status.

The argument stressing that education, access to services and the supply effect could be more important that other fixed characteristics of individuals to explain health disparities is also present in Palacio (2011), who used a pooled dataset of several waves of the Demographic and Health Surveys covering almost three decades in Colombia. Based on the relative index of inequality for infant mortality rather than the concentration index, he found that the occupational gradient vanishes once education and wealth are controlled for, and that preventive measures such as health habits are more important in infant mortality than medical services. However, that is the case when studying the

evolution on time from a pooled perspective, where the epidemiological transition is evident in infant mortality in middle-income economies. Maydana et al. (2009) found different results for Bolivia using census data for 2001. However, Bolivia is a country at an earlier stage of development within LAC. He confirmed the negative association between the mortality rate and a set of socioeconomic indicators and also found higher probability of being at risk of death for poorer regions and lower SES. These two studies confirm the fact that at early stages of development and low relative national income, the absolute level of SES is what matters, as the case of Bolivia, while the relative income is more important when the economy is at richer standards, as the Colombian example.

The last strand of this literature, which is more related to the present paper, has measured the degree of health inequalities and has decomposed it. The idea behind it is that provided there is inequality, this can be decomposed into their causes, changes in means and the degree of inequality on each of its determinants. Unlike the previous examples that were aimed to assess to what extent a distinctive measure of health is associated with SES or other characteristics of individuals, or how the risk of illness and death covariates with SES; this strand directly measures the degree of health inequality and explains it as changes in the average levels of SES or other socioeconomic characteristics, plus variations in the degree of inequality of those determinants.

Examples of decomposition analysis of malnutrition in developing economies are common. This literature measures the degree of inequality through a concentration index of stunting and wasting, and then it is decomposed on changes in means and partial inequalities of its determinants. Wagstaff et. al (2003) and Salvucci (2012) have found for Vietnam and Mozambique, respectively, that health disparities are largely accounted for by inequalities in consumption and in unobserved commune-level (or location) effects, stressing the effect of health supply inequalities. Nkonki et al. (2011) got similar results for South Africa, suggesting that inequalities in child health are largely accounted by inequalities in availability of infrastructure, socioeconomic position and area of residence, coupled with large inequalities in the use of immunization services. Goli (2012) also found that inequalities in education and access to health care are critical variables in assessing health among older cohorts in India.

As an international comparison, Van de Poel et al. (2008) calculated the socioeconomic inequalities in 47 developing economies using the Demographic and

Health surveys by decomposing the concentration index for two anthropometric measures. They found that stunting disproportionately affected the poor and the SES-inequality of malnutrition appears larger in Latin America compared to Africa or Asia. In addition, the SES-inequality is much more pronounced for stunting than for wasting. They also found that there was no clear association between average stunting and socioeconomic inequality in stunting among the whole sample. Nevertheless, if only socioeconomic inequality in Latin America and the Caribbean region was considered, there was a positive association between a high average level of stunting and high socioeconomic inequality in stunting. This put clear evidence of the deep inequalities present in the region.

4. Methodology

4.1. The concentration index.

The empirical strategy on the present paper is as follows. Provided the fact that malnutrition and overall health in Ecuador has improved across the years, the main objective is to go beyond and assess whether or not that improvement is reflected across the whole distribution of income. In order to do that a concentration curve and its underlying concentration index (CI) is computed for each year, i.e. 2004 and 2012. The concentration curve and concentration index are modifications of the Lorenz Curve and the Gini index, whose principal difference relies in the fact that the formers assessed the inequality of a variable of interest y (health or illness), of individuals ranked by income (Kakwani, Wagstaff, and van Doorslaer, 1997). In this case y is the variable in whose distribution of SES are we focused on.

The concentration curve (L) plots the cumulative proportion of y on the vertical axis against the cumulative proportion of the population ranked by income on the horizontal axis, starting from the poorest to the richest. If L lies above the diagonal that represents perfect equality, then the greater is the degree of inequality of y across the SES distribution. The concentration index, denoted as CI, is defined as twice the area between L and the diagonal (Wagstaff, A., Paci, P. and van Doorslaer, E., 1991; Kakwani et al., 1997).

$$(1) \quad CI = \frac{2}{n\mu}\sum_{i=1}^{n} y_i R_i - 1$$

Where μ is the mean of y, n is the number of observations and R_i is the fractional rank of the ith person in the SES distribution. The CI takes a value of zero when L coincides with the diagonal of perfect equality, is negative when L lies above, or positive otherwise. In the present paper, y is a "bad", that is, an indicator of illness, such as malnutrition, so inequalities at the expense of the poor (higher prevalence of stunting or underweight amongst the poor) push L above the diagonal and CI becomes negative. The value of CI maps between -1 and +1.

The CI, just as the Gini coefficient, is a measure of relative inequality, which means that is independent of the mean, namely doubling everybody's health leaves CI unchanged. The advantage of the CI with respect to other health inequality indicators is that it accomplishes the three conditions required to reflect health inequalities: 1) be able to reflect the socioeconomic disparities in health, 2) incorporate information of all the individuals of a population defined by the indicator of health, 3) be sensitive to changes in the distribution and the size of the population along the socioeconomic status (Wagstaff et al., 1991).

As (1) shows, the concentration index depends mainly on the covariance between y_i and R_i. Given the relation between covariance of two variables and a linear OLS regression, it is therefore proportional to the coefficient of the linear regression of y_i on R_i of the form presented by equation (2)[14]:

$$(2) \quad \frac{2\sigma_R^2}{\mu} y_i = \alpha + \beta R_i + \varepsilon_i$$

Where σ_R^2 is the variance of R_i and μ is the mean of the health variable y_i. This is a more convenient way of computing CI and to easily evaluate its statistical attributes.

Moreover, Wagstaff (2002) shows that another way of interpreting Eq. (1) could be incorporating an inequality aversion term in the calculation of the CI without modifying its interpretation. Eq. (1) is a specific Concentration Index of a general family with the form:

$$(3) \quad CI(v) = 1 - \frac{v}{n\mu} \sum_{i=1}^{n} y_i (1 - R_i)^{v-1}$$

[14] See Fleubaey and Schokkaert (2012) or Wagstaff et al. (2003) to a detailed demonstration.

Where v is an inequality aversion term that assigns a higher weight for the health status of poorer individuals. When $v = 1$ everyone is weighted equally and inequality does not matter. When $v = 2$ Eq. (3) takes the same form as with the standard concentration index. On the same lines, Wagstaff (2002) propose to measure the average level of health in a population adjusting for the level of inequality in health between the poor and the better-off; this is what is called the achievement index $I(v)$. $I(v)$ is a transformation of the CI, and takes the form of:

$$(4) \quad I(v) = \frac{1}{n}\sum_{i=1}^{n} y_i v(1 - R_i)^{v-1}$$

Which is only a weighted average of health, where the weights comes from the inequality aversion term v.

4.2. Decomposition analysis of the concentration index

Furthermore, once the degree of inequality is gauged it would be interesting to see what are the drivers of health inequalities, and following the theory of relative and absolute income effects on health, observe if changes in CI comes from changes in inequality or changes in average levels of its determinants. Besides, decomposing is helpful to determine to what extent child health is affected by other features of parent's background (in the lines of the Grossman model) and fixed characteristics of the individual, such as race or place of residence, on the lights of the literature on inequality of opportunities.

The determinants of health could be computed through a linear regression model linking the variable of health y, to a set of covariates, x_k :

$$(4) \quad y_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i$$

Where β_k are a set of coefficients measuring the average impact of x_k on health and ε_i is an error term. In equation (2) it is assumed that everyone, irrespective of their income, have the same coefficient. According to Eq. (2), variations in y are only assumed to depend on variations of x_k across individuals. However, given the relationship between y_i and $x_{i,k}$, the concentration index can be written as:

$$(5) \quad CI = \sum_n \frac{\beta_k \bar{x}_k}{\mu} C_k + \frac{GC_\varepsilon}{\mu}$$

Where μ is the mean of y, $\bar{x}_k$is the mean of x_k, and C_k is the concentration index for x_k defined in the same way as in equation (1). The last terms could be computed as a residual once CI was calculated and represents a generalized concentration index for ε_i. This last term is analogous to the Gini index. Equation (5) means that the CI is integrated by two components. The first one is a weighted sum of the concentration indexes of the *k* regressors, where the weight is the elasticity of y_i with respect to $x_{i,k}$. The last term is a residual that cannot be explained by systematic variation in $x_{i,k}$ across SES groups.

4.2.1. Decomposition in changes in health inequalities.

This last decomposition is appropriate when one is interested in total changes in health inequalities. The immediate approach could be only to apply a difference on each term of the CI between t and $t-1$. However, this would not allow us to disentangle if changes in health inequality come either from variations in inequality within the determinants of health, from new levels on average health across the population, or from changes in the elasticities.

In order to do that a total decomposition is done. A total decompositions is not more than a total derivative of CI with respect to all its components, i.e. α, β_k, $\bar{x}_k$, C_k and GC_ε. It could be possible, for instance, that changes in CI are due more to changes in β_k than to changes in the mean of x_k, or the other way around. In fact, it could be the case that both have changes in different directions, offsetting each other. Equation (6) denotes the total decomposition analysis.

$$(6) \quad dCI = \Delta CI$$
$$= -\frac{CI}{\mu} d\alpha + \sum_k \frac{\bar{x}_k}{\mu} (C_k - CI) d\beta_k + \sum_k \frac{\bar{\beta}_k}{\mu} (C_k - CI) d\bar{x}_k$$
$$+ \sum_k \frac{\bar{\beta}_k \bar{x}_k}{\mu} dC_k + d\frac{GC_\varepsilon}{\mu}$$

The first term in (6) computes the impact of overall changes in the health measure. In this case, we are using a variable of illness (malnutrition), so the first term would compute

how an increase in malnutrition equal across everyone would impact CI. To illustrate this, let's imagine average malnutrition is positive and that it is concentrated among the poor, an increase in malnutrition in the same amount across everyone would mean a worsening in CI given the fact malnutrition is disproportionally concentrated amongst the poor. On the other hand, the second and third terms show how CI has changed depending on whether β_k and/or x_k are more or less unequally distributed than y (Wagstaff et al., 2003, p. 6)

5. Data

The present section is devoted to explain the databases used in the paper and to present some descriptive statistics regarding the situation of malnutrition amongst children in Ecuador. The main difference with respect to previous research for Latin America or Ecuador is twofold in this aspect: the comparability of malnutrition indicators between 2004 and 2012 through changes in the elasticities, the means and the inequality in each of the child health determinants and the use of a very recent database. As it was presented before, previous research were more descriptive or aim only to estimate the probability of being at risk of death (child mortality) or immunization use by children. Such studies were restricted to interpret inequalities in health by the partial contribution that ethnicity or SES indicators have on child mortality or immunization rates.

In that sense, the present paper is the first attempt to measure inequality in health using a decomposition analysis for Ecuador. The country has a lack of specific studies (country cases) in this area of studies, at least under the knowledge of the author and the revision of the applied literature. Besides, the present paper is probably one of the first empirical papers that used the ENSANUT, a very recent survey on health developed by the National Institute of Statistics and the Public Health Ministry of Ecuador.

5.1. Data source

The data used in the present exercise corresponds to two household surveys. The first one is the Maternal and Child Health Survey 2004 (ENDEMAIN by its Spanish acronyms) and the recently published Health and Nutrition Survey 2012 (ENSANUT by its Spanish acronyms). Each survey was carried by a different institution. The former was done by the Centre for Research on Population and Social Development (CEPAR by its Spanish acronyms), a local NGO in charge of doing these surveys in Ecuador since the

80s with the support of the World Health Organization (WHO), the National Institute of Statistics and Census (INEC), the Public Health Ministry (MSP) and several international cooperation agencies. The ENDEMAIN is basically the same survey as the well-known Demographic and Health Surveys (DHS), but excluding some modules and focusing only on children and mothers health.

On the other hand, the ENSANUT was developed by the National Institute for Statistics and Census. This survey emerged as the need to update the last ENDEMAIN, precisely of 2004, and to include other extra information such as health risks and extra biological indicators (urine, blood, nutrition). The ENSANUT includes the whole ENDEMAIN questionnaire.

In spite of being different surveys, the objective and methodologies are the same. Both are national, regional, provincial and urban/rural representative surveys and also include self-representation for the two most populated cities (Quito and Guayaquil). The sampling methodology is the same: probabilistic, stratified and with three stages.[15] Sampling weights are provided in the survey datasets. 16,608 households for 2004 and 19,968 for 2012 were interviewed about maternal and child health in each survey. Both sources are rich on socioeconomic and demographic information of the household which enriches the possibility of a better analysis in the cases of SES-related child health inequalities. Table No. 1 below presents the descriptive statistics for the variables of interest used in analyzing health inequalities.

For what concerns to child health, both surveys include information on age, length/height and weight for children aged 0 to 60 months. In ENDEMAIN 2004 there is a sample of 6,364 children and in 2012 the sample is of 10,847. The difference between these numbers and those indicated in Table No. 1 are due to missing age or height, what made it not possible to calculate standardized anthropometrics.

[15] First it is chosen the domain (strata) corresponding to all the provinces in Ecuador, then an amount of segments/sectors per domain is selected depending on the population based on the last available census data (Census of 2001 for the ENDEMAIN and Census of 2010 for the ENSANUT) in such way the second stage guarantees equal probability of selection, and finally a random sampling of households is designated per sector.

Table No. 1

Descriptive statistics for the variables of interest used in the calculations

	2004					2012				
Variable	**Obs**	**Mean[a]**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Mean[a]**	**Std. Dev.**	**Min**	**Max**
Height-for-age Z score	5162	-1.31	1.30	-5.00	4.84	8747	-1.21	1.46	-5.00	4.97
Age (months)	5162	30.76	17.08	0.16	60.58	8747	29.62	17.01	0.00	60.98
Age (squared)	5162	1,237.59	1,070.61	0.03	3,670.32	8747	1,166.59	1,077.51	0.00	3,718.25
Asset Index	5162	0.05	0.77	-2.32	2.17	8747	0.76	1.14	-2.71	4.59
Household size	5162	4.79	1.92	1.00	18.00	8747	5.23	1.99	2.00	19.00
Mother Educ.	5162	9.02	3.93	0.00	21.00	8747	8.30	4.38	0.00	20.00
Father Educ.	5162	8.59	3.59	0.00	23.00	8747	8.36	4.94	0.00	20.00
Urban	5162	60.3%	-	-	-	8747	65.1%	-	-	-
Male	5162	52.0%	-	-	-	8747	49.5%	-	-	-
Insurance	5162	11.0%	-	-	-	8747	38.4%	-	-	-
Safe water	5162	81.8%	-	-	-	8747	94.9%	-	-	-
Proper Sanitation	5162	83.7%	-	-	-	8747	89.4%	-	-	-
Mestizo	5162	88.0%	-	-	-	8747	82.3%	-	-	-
Indigenous	5162	7.6%	-	-	-	8747	13.1%	-	-	-
Afroecuadorian	5162	3.6%	-	-	-	8747	4.2%	-	-	-
Others	5162	0.8%	-	-	-	8747	0.3%	-	-	-

[a] Urban, Male, insurance safe water, proper sanitation, indigenous, Afroecuadorian, White and Others, indicate the percentage of the population that belongs to the category

Source: Author's calculations

As it could be seen from the previous table, in terms of the structure of the survey both are similar. In both cases the urban sector is higher than rural and the difference widened, what is expected given the composition of the population in Ecuador, and urbanization is still increasing. In addition to that, there are some points to note. First, there is reflected an important improvement in terms of coverage of health insurance by children (either the public social insurance system or a private health insurance, or both), from 11% in 2004 to 38% in 2012. Besides, the sanitation is also better; access to a secure source of water increased from 82% to 95% and living in a house with a proper sewerage system rose from 84% to 89%.[16] Besides, what looks implausible is the change in the ethnic composition. The percentage of indigenous has increased notably while the mestizo/ white population has decreased, this reveals that some people that used to declare themselves as mestizos or whites, now declares being indigenous. This could happen only if people have modified their self-perception as long as the division is based on a self-assessed race. This is not an isolated case for Ecuador and is common in very fragmented societies.

[16] Access to safe water means access to piped water inside or outside the house, or access to a fountain or irrigation ditch. Proper sanitation implies the house has a flush toilet connected to a public sewage net or to a cesspool or an improved letrine.

Regarding the socioeconomic status, the table presents an index of wealth based on the asset holdings of the households. This deserves some words. In spite of the similarities of the two surveys, they do not ask households about the same variable of welfare. The ENDEMAIN asks about total consumption of the household whereas ENSANUT asks about income. This makes it impossible to compare the SES-related health inequalities across years using different variables to rank people. However, both surveys incorporate several variables about characteristics/type of the house, access to public services and assets the household has. Given the fact that this information is the same across years it is possible to create an index that measure the wealth based on those features[17].

The advantage of an asset-based index is the fact that it is more reflective of long-run well-being and the living standards of the family, but fails in measuring the short-run dimension of welfare (Montgomery et al., 2000). Nevertheless, as long as the present thesis deals with a measure of medium-term health or accumulative health, a measure of wealth is better. The use of an index of assets does not come without any cost though. It is of importance the fact that the ownership of some assets does not necessarily distinguish better-off households from the worse-off. For instance, having a TV might be generalized, but the survey does not capture the quality or the technology that otherwise would help to differentiate the richest from the middle class or from the poor. This problem was solved using the quantity of each asset, assuming the more always reflect the richer. Moreover, it is also argued that some assets have different relationship with SES across sub-groups. Having some assets could be more related with rural areas, such as farmland or certain characteristics of the sanitation or public services. In order to solve this drawback, the index was computed separately in urban and rural areas.

The construction of the index was based on principal components analysis (PCA). This is a very common technique amongst the literature of SES-related health inequalities given the fact that the Health surveys usually do not incorporate income or consumption but assets (Montgomery et al., 2000, Larrea and Freire, 2002). The PCA is used to reduce the number of variables of a dataset into fewer dimensions. What it does is to extract

[17] Both surveys ask about the type of the house (house, department, etc), material of the roof, walls, floor, number of rooms in the house, number of dormitories, whether the house have a specific space devoted to kitchen, whether the house has a bathroom inside or outside, the source of water, the waste disposal, access to piped water, sanitation, electricity source, whether there is a telephone line, among other characteristics. In addition, its asks whether the household has a tv, dvd/blue ray, sound equipment, computer, stove, fridge, fans, air conditioning, microwaves, bicycles, motorcycles, cars, among others, and the quantities of each asset.

uncorrelated components, where each component is a weighted combination of the initial variables on such a way that each factor is independent (orthogonal) to the others and at the same time it maximizes the original variance, i.e. it tries to reflect the variability of the asset holdings and minimize the error of prediction (Vyas and Kumaranayake, 2006).[18]

Twenty eight variables were used to construct the index. As the majority reflect the characteristics of the household many of them were categorical, namely have several options per variable, so it was prepared binary variables for each option.[19] In the appendix (Graph No. 11) it is presented the graphs of the distribution functions of the index for both the urban and rural areas in each year. As it could be seen, the shape of the functions mirrors a normal distribution, indicating a proper construction and allowing to differentiate people. A particular difference across the years is that in 2004 the distribution is centered around zero while in 2012 is a little skewed towards the richer (to the right). In the PCA a negative score for a variable is associated with lower SES, and conversely a positive is associated with higher SES. In the same lines, the higher the overall score for a household, the wealthier. Table No. 2 below present summary statistics for the index.

Table No. 2

Wealth (Assets) index score by quintile, 2004-2012

	2004					2012				
Quintile	**Freq.**	**Mean**	**Med**	**Min**	**Max**	**Freq.**	**Mean**	**Med**	**Min**	**Max**
Poorest	1,047	-1.33	-1.26	-2.76	-0.87	1784	-0.98	-0.88	-2.71	-0.42
2	1,037	-0.57	-0.56	-0.87	-0.31	1764	-0.03	-0.01	-0.42	0.289
3	986	-0.06	-0.06	-0.3	0.2	1734	0.601	0.608	0.289	0.893
4	1,054	0.5	0.49	0.2	0.84	1737	1.209	1.198	0.895	1.566
Richest	1,127	1.46	1.28	0.84	5.39	1728	2.21	2.112	1.566	4.586

Source: Author's calculations

5.2. Descriptive statistics

Regarding health, the present paper shows SES related child health inequalities using anthropometric measures such as height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ), but the calculations and decomposition are focused on height-

[18] Minimize the Mean Squared Error.
[19] For instance, for the 6 options of the floor material, it was constructed 6 binary variables indicating each one to what category the household belongs.

for-age (WHO, 1995, Alderman, 2000). According to the literature, nutritional status can be seen as a production function, in which nutrient intake is one of the inputs, but where other household, individual and characteristics of the place of residence also influence (O'Donnell et al., 2008). In that sense, anthropometrics are useful to address the adequacy of growth and diet, especially amongst children, given the fact that genetic is not decisive in the very early stages of life, and provided it is standardized for sex and age and compared with a reference "healthy" population (Alderman, 2000).[20]

If the z-score lies below -2 in each of the measures it is labeled as stunting, wasting and underweight, respectively. An additional contribution of the present thesis is that anthropometrics are standardized using the new criteria issued by the WHO in 2006, which is based on measures coming from populations of diverse ethnicities and cultural environments (de Onis et al., 2006, WHO, 2006), previous research used standardized anthropometrics with the USA-based standards of the 90s.[21] Table No. 3 below shows summary statistic for the three health indicators.[22]

Table No. 3

Descriptive statistics for Child Anthropometric Indicators in Ecuador, 2004/2012[23]

	2004			2012		
Variable	**HAZ**	**WAZ**	**WHZ**	**HAZ**	**WAZ**	**WHZ**
Mean	-1.31	-0.50	0.34	-1.19	-0.37	0.37
Std. Error of the mean	0.02	0.01	0.01	0.02	0.01	0.01
Std. Deviation	1.30	1.05	1.07	1.48	1.25	1.16
% Below -2 S.D.	30.4%	6.7%	2.1%	26.0%	6.7%	2.1%
% Below -3 S.D.	9.2%	1.3%	0.6%	7.9%	1.6%	0.8%
n	5162	5162	5162	8747	8747	8747

Source: Author's calculations

As it could be seen both the mean and the percentage of the population below two and three standard deviations below zero have reduced between 2004-2012, consistent with better economic outcomes, a sustained rise in per capita GDP and increase in the Human Development Index. However, the mean z-scores are still below zero, suggesting

[20] When computing the standardized indicators the WHO (1995) suggest dropping the cases that have "implausible" values. The criterion to drop these outliers is as follow: for HAZ if the z-score exceeds -6 or +6, for WAZ if it exceeds -6 or +5 and finally for WHZ if it is below -5 or above +5.

[21] The new standards are based on data from Brazil, Ghana, India, Norway, Oman and the United States of America.

[22] The standardization of anthropometrics was done in Stata using the command zscore06, developed by Leroy, Jef. L. (2011).

[23] Based on the new standars for healthy growth issued by the WHO in 2006.

an important presence of malnourishment amongst the population. Following the specialized literature, the criterion determines malnutrition when an individual reaches a z-score below -2 (WHO, 1995).

It is also desirable to observe the change on health indicators by age and sex, given the fact that the pattern of growth failure could diverge and because it is easier to detect malnutrition determinants. The WHO (1995) suggests to divide the children population it in at least two groups, lower and higher than 24 months.[24] Table No. 5 presents the results.

Table No. 4

Prevalence of stunting, wasting and underweight, by age and gender 2004-2012

		2004			2012		
Age (months)	**Sex**	**HAZ *(<-2)***	**WAZ *(<-2)***	**WHZ *(<-2)***	**HAZ *(<-2)***	**WAZ *(<-2)***	**WHZ *(<-2)***
0-23	Boys	26.4%	6.3%	3.9%	28.7%	8.6%	3.6%
	Girls	22.0%	4.8%	4.1%	24.5%	6.2%	2.4%
	Combined	**24.3%**	**5.5%**	**4.0%**	**26.7%**	**7.4%**	**3.0%**
24-60	Boys	35.7%	6.8%	0.8%	28.0%	5.5%	1.6%
	Girls	34.3%	6.6%	0.6%	27.1%	5.7%	1.0%
	Combined	**35.0%**	**6.7%**	**0.7%**	**27.6%**	**5.6%**	**1.3%**

Source: Author's calculations

It is noteworthy that the highest reduction in stunting is among the older children, namely between 24-60 months. Between 0 and 23 months the indicators worsen between 2004 and 2012. This suggest that more attention should be put in health care in the very beginning of life.

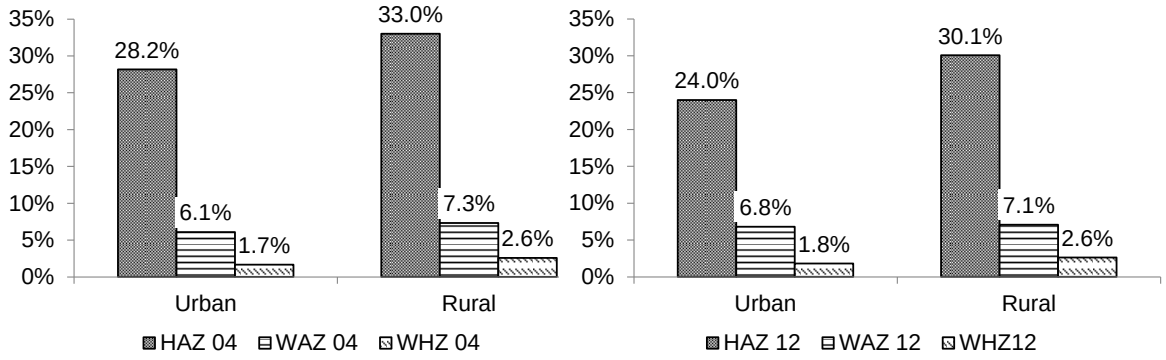
In addition to the prevalence of malnutrition by sex and age, table No. 5 below displays the prevalence of stunting, wasting and underweight by several categories. Malnutrition is generally higher in rural areas, in males and amongst indigenous people. Furthermore, the gap between urban and rural areas has widened between 2004 and 2012, malnutrition has increased for indigenous and for the poorest people (quintile 1). On the other hand it has reduced the most for mestizos/whites. Moreover, what highlights is

[24] How the data is taken is also different between these two groups. If age is less than 24 months it is measured the length of the child whereas for older children is height.

the fact that in 2012 malnutrition has a marked negative relationship with SES, but in 2004, in spite of a decreasing trend against wealth, this is not as clear as in 2012.

Graph. No. 4

Prevalence of stunting, wasting and underweight by area of residence



Source: Author's calculations

Table No. 5

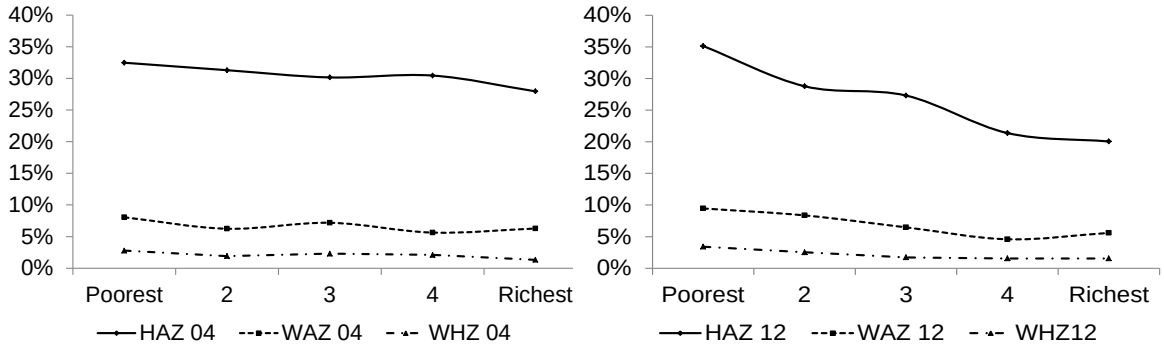
Child malnutrition by individual and household characteristics

	2004			2012		
	Stunting	**Wasting**	**Underweight**	**Stunting**	**Wasting**	**Underweight**
Urban	28.2%	6.1%	1.7%	24.0%	6.8%	1.8%
Rural	33.0%	7.3%	2.6%	30.1%	7.1%	2.6%
Male	31.7%	7.1%	2.1%	27.7%	7.5%	2.6%
Female	29.1%	6.2%	2.0%	25.5%	6.3%	1.8%
Indigen.	32.2%	8.3%	2.7%	34.1%	8.1%	3.0%
Afroec.	27.1%	7.4%	3.4%	24.1%	12.2%	2.0%
Mestizo/White	30.3%	6.5%	2.0%	25.1%	6.4%	2.0%
Others	26.8%	0.0%	0.0%	30.6%	5.6%	2.8%
Lowest Quintile	32.5%	8.0%	2.8%	35.1%	9.5%	3.4%
2	31.3%	6.2%	1.9%	28.8%	8.4%	2.5%
3	30.1%	7.2%	2.3%	27.3%	6.5%	1.7%
4	30.4%	5.6%	2.1%	21.4%	4.6%	1.5%
Highest Quintile	27.9%	6.3%	1.3%	20.0%	5.6%	1.6%
Primary	31.2%	6.7%	1.9%	31.3%	7.9%	2.5%
Basic (9 years)	29.0%	6.7%	2.5%	26.4%	7.0%	2.2%
Secondary	30.6%	6.6%	2.5%	20.8%	6.1%	1.6%
Superior	29.7%	6.8%	1.6%	19.4%	4.3%	1.6%

Source: Author's calculations

Graph. No. 5

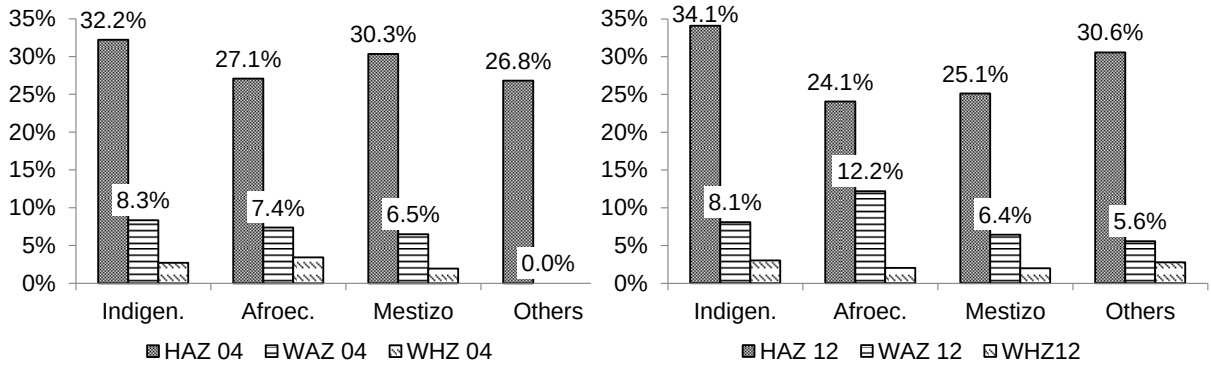
Prevalence of stunting, wasting and underweight by quintile of wealth (asset index)



Source: Author's calculations

Graph. No. 6

Prevalence of stunting, wasting and underweight by race



Source: Author's calculations

As a conclusion, the stylized facts indicate us that the improvement in child health is concentrated among the richest, mestizos/whites, with higher parent's education, males and urban areas, whereas the worsening has come for the indigenous, the poorest quintile and children from parents with little education. It is also known that the poorest and indigenous are overlapped categories; indigenous people are usually the poorest and most vulnerable subgroup (Bermeo, 2012). The descriptive evidence would indicate that the overall improvement in malnutrition that is reflected in average measures is not due to progresses among the whole SES distribution. It is important to note that the low decreasing gradient between health and SES observed in 2004 could have something to do with the missing values. About 17% of the data were missed in each survey due to missing age, height or implausible z-scores. This feature is taken into account in the next section.

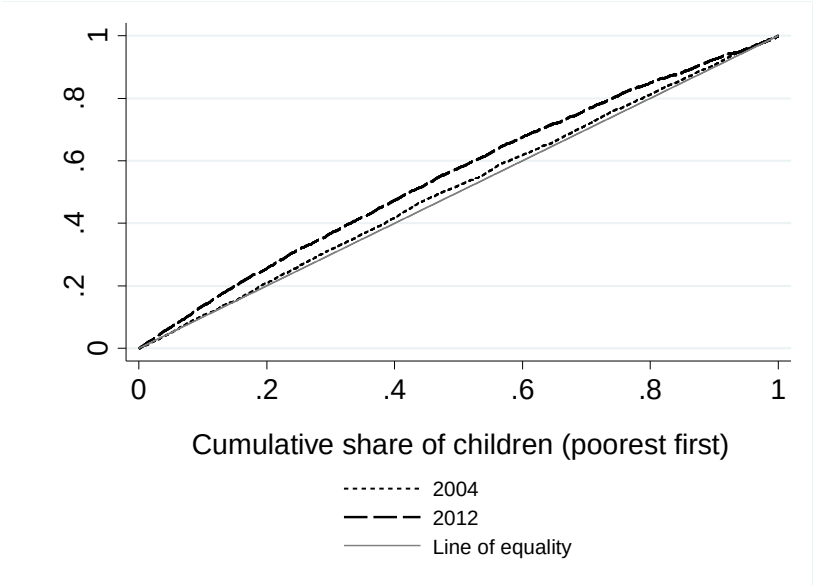
6. Results

6.1. Concentration and achievement index

This section presents the results for the concentration curve and concentration index computed using Eq. (2). As it could be seen in Graph 8 below, the curves for both years lie above the line of perfect equality, then it is concluded that the poorer disproportionally concentrate higher levels of malnutrition. Additionally, it could be seen that the curve of 2012 might be above the 2004 along the whole wealth distribution, meaning that the SES-malnutrition gradient is more pronounced in 2012 than 2004, i.e. inequality in malnutrition would be higher in 2012 than 2004. To formally test for a statistically significant difference between the two years this it is used a dominance test developed for Stata by O'Donnell et al. (2008). The test uses two criteria. First of all, it sees if there is at least one quantile in which curve A lies above curve B and there is no quantile in which curve B lies above A, if so A dominates B. This is tested for 19 quantiles and is known as the multiple comparison approach (mpa). The second criteria is to look for significant differences at all quantiles to accept dominance, this is the intersection union principle (iup) (O'Donnell, et al., 2008).

Graph No. 7

Concentration curves for the negative height-for-age z-score, 2004-2012



Source: Author's calculations

Table No. 6

Test of stochastic dominance for the concentration curves 2004 and 2012[25]

Data 1	Data 2	Sign. Level	# points	Rule
2004	2012	5%	19	mca
Result: 2012 dominates 2004				
2004	2012	5%	19	iup
Result: Non-dominance				

Source: Author's calculations

The test confirms what is suspected visually for the mpa criteria, that 2012 stochastically dominates 2004 and consequently inequality is more severe in 2012. However, using the iup criteria, which is more strict, there is no dominance due to the fact that both curves overlapped in the very bottom and very top of the wealth distribution. Nonetheless, the mca criterion is preferred and then it is concluded that inequality is more severe in 2012.

Once the concentration curve is drawn and it was tested that the SES-related inequality in child health is higher in 2012 than 2004, it is calculated the CI and the Achievement index according to Eq. (2) and Eq. (4). Table No. 8 below presents the results. In both years the CI is negative and statistically significant, meaning that malnutrition is disproportionally higher amongst the lower SES in both years. Nevertheless, the distribution of malnutrition in 2004 is more egalitarian, as it was seen in the concentration curve and confirmed with a lower CI.[26] Besides, the CI is more negative in 2012 than 2004, confirming that the SES-related inequality is higher in 2012. In addition to that, the higher the inequality aversion (i.e. the higher the weight is given to a very poor individual) the CI becomes increasingly more negative in 2012 than 2004.

Moreover, the achievement index, which measures the average level of malnutrition (in this case, the average value of the negative of the height-for-age z-score) weighted by an inequality aversion term as Eq. (4) , indicates that as the level of aversion is higher the average z-score rises. This increase is greater in 2012 than 2004. The average percentage of increase when the level of aversion grows from 2 (standard) to 5

[25] Based on the command "dominance" developed for Stata by O'Donnell et al., 2008.
[26] This is coherent with a Concentration curve of a bad (illness or malnutrition) lying above the 45° line.

(the highest presented) is 0.9% for 2004 and 3.3% in 2012. As long as malnutrition declines monotonically with income, the greater the degree of inequality and inequality aversion, the greater is the wedge between the mean and the value of the achievement index, this gap is proved to be higher in 2012. This confirms that the level of stunting concentrated amongst the poorer is more pronounced in 2012 even though the average level of malnutrition is lower in this year.

Table No. 7

Concentration and Achievement Index, 2004-2012

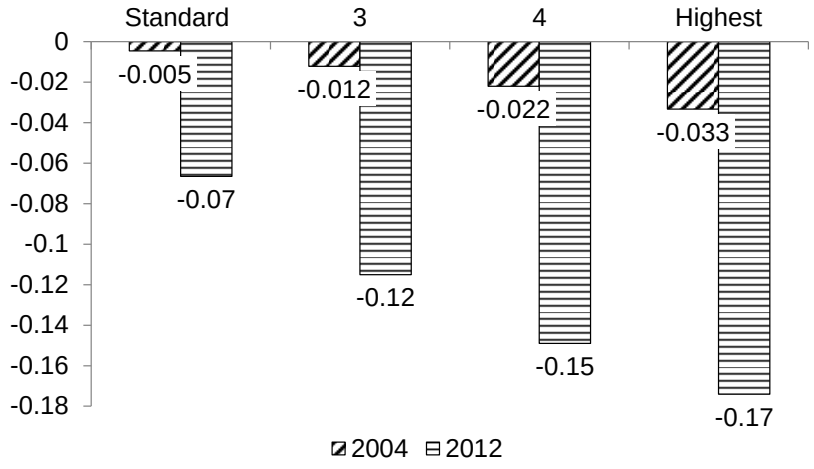
Ineq. Aversion	2004		2012	
	CI	Achiev. Ind.	CI	Achiev. Ind.
Standard $(1-R_i)^2$	-0.00453** (0.00195)	131.47	-0.0665*** (0.0110)	129.25
$(1-Ri)^3$	-0.0122** (0.00530)	132.47	-0.115*** (0.0179)	135.10
$(1-Ri)^4$	-0.0220** (0.00962)	133.76	-0.149*** (0.0234)	139.22
Highest $(1-R_i)^5$	-0.0333** (0.0146)	135.24	-0.174*** (0.0281)	142.26

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

Graph. No. 8

Concentration index with different inequality aversion degrees



Source: Author's calculations

6.2. Determinants of malnutrition

In this section the next step is incorporated and the determinants of malnutrition are measured. It is required to determine the average contribution of each determinant of malnutrition in order be able to decompose the CI based on these determinants. Calculations are based on height-for-age. As it was aforementioned, the advantage of using stunting is that it reflects more precisely long-term malnourishment whereas wasting and underweight are more restricted to short-term deprivation or the presence of illness. Besides, the great majority of the literature that study child health in developing economies relies on analyzing height-for-age (Larrea and Freire, 2002, Wagstaff et. al., 2003, Christiaensen and Alderman, 2004, Van de Poel et al., 2008, Nkonki et al., 2011, Salvucci, 2012). In order to implement a regression-based methodology, it was transformed the z-score of the height-for-age into its negative value, i.e. it was multiplied the z-score*(-100). This transformation does not modify the distribution of malnutrition, but make it easier to interpret the coefficients on the regression since now malnutrition is increasing in the z-score, so a positive β indicates higher malnutrition conditioned on the respective variable. This transformation is also very common in the literature.[27]

In this thesis it is used what is called a reduced-form demand model for child health status. Based on the postulates of the Grossman model (2000), it is used variables for child, household and community characteristics. For children features it is included the age of the child in months, a term of the squared age to allow for non-linearities in the relation of age and malnourishment, a dummy variable indicating whether the child is a boy and three dummies indicating the race of the child. The omitted group of comparison is mestizos/whites. The variables that refer to household characteristics are the SES measured by the wealth index, the household size, the parent's years of education, and dummies indicating whether the household have a comprehensive health insurance covering children and whether the household has access to safe water and proper sanitation. The community characteristic is reflected by a dummy indicating if the place of residence is an urban area.

Three models are developed to explain the variation in the negative of child height-for-age z-score. The first one is a standard OLS that incorporates the full design of the

[27] As the malnutrition variable is re-scaled, to interpret the coefficients one needs to divide them for 100. Moreover, as the dependent variable is a standardized indicator (z-score), the parameters of regressions in table No. 6 below shows the average impact of each variable in standard deviations from the mean.

surveys (i.e. the sampling strategy) to estimate the parameters and get efficient standard errors. As long as the sampling and stratification method of the surveys are based on some endogenous variables that are also explanatory variables (e.g. urban/rural area), then it is required to adjust standard errors to this condition (O'Donnell, et al., 2008).

In addition, it was observed that about 17% of the data is missed, and that it could be that the missing values are not randomly distributed, so it was also computed a Heckman selection model (Heckman, J, 1979). In this model it was also included the full stratification and sampling design of the survey. A Heckman selection model adjusts the estimation with the probability of being observed; in that sense it gives the coefficient of each health determinant adjusting for the selection bias that could arise from computing the estimators only for the children that report information. The selection equation in the Heckman model, which is the one that estimates the probability of being observed and therefore serves to adjust the estimators in the malnutrition equation, has as the dependent variable a dummy indicating whether the child has an observed z-score. Besides, the explanatory variables of this equation are the level of education of the mother, the area of residence and two exogenous instruments: the age of the mother, and either household per capita consumption for 2004 or household per capita income for 2012. Those variables are not used in the quantity equation (i.e. the equation of malnutrition) so serve to instrument the SES. It is believed that the probability of reporting anthropometric information depends directly on those characteristics.

The third model incorporates the possible presence of unobserved location fixed effects. To account for those effects it was also run both a fixed and random effects model, and was used the best specification based on the Hausman test.[28] These models were added for the need to correct for the likely correlation between unobserved factors that exist in the clusters of the sampling design and the explanatory variables. For instance, the SES, the access to insurance or having piped water could be correlated to unobserved factors of the different areas used in the sampling. Furthermore, correcting for the unobserved fixed effects present in the clusters adjusts for differences in the quality and quantity of public utilities available in each sector, differences in infrastructure, among other conditions that are not observed directly in the data. In this case the fixed effect is

[28] The Hausman test determines which model gives consistent and efficient estimators.

based on the sectors of sampling. These sectors are usually villages or neighborhoods of cities.

The idea behind estimating different models is that it is essential to obtain consistent and efficient coefficients, given the fact that the further decomposition analysis of the concentration index is based on the elasticities, which in turn comes from these parameters. The first important finding is that in spite of the missing data, the Heckman selection model present for each year is not statistically significant, which suggests that the error term of the malnutrition equation and the selection equation are not significantly correlated; that is, the unobserved factors that affect reporting data on anthropometrics are not systematically related with malnutrition.[29] Based on this evidence, the decision of the best model was between a standard OLS and a model controlling for fixed effects. The bottom of column (2) in table No. 6 below shows both the F-test for joint significance of the sectors effects and the Hausman test to select between a fixed or random effects model. As it could be seen the sector effects are statistically significant in both years, that is, it is necessary to account for unobserved sector effects and the Hausman test confirm that the best specification is a fixed effects model.[30] Table No. 6 below shows the results of the regressions for the three models. The results of the Heckman selection model are presented in Table No. 11 in the appendix.

Results indicate that the age has a clearly u-shaped relationship with malnutrition according to the linear and squared age terms. The tipping point since the malnutrition conditioned on the other variables starts to decrease is around 36-38 months. The wealth has the expected negative sign, but the relationship is much more decreasing in 2012 than in 2004 (as it was also seen in comparing the means in the descriptive section). In 2004 a higher wealth index decreases malnutrition by 0.04 standard deviations while in 2012 it is reduced by 0.12 standard deviations. Besides, in 2004 it is not significant at all. Likewise, the higher the household size, the higher the malnutrition. The negative coefficient for this variable in 2004 is very small (about 0.008 standard deviations) and is also not significant.

[29] To assess whether the probability of being observed is correlated with the malnutrition equation it is necessary to compute the lambda (λ) term in a Heckman Model. The λ term is equal to $\rho * \sigma$. The sign of λ determines the direction in the correlation between the probability of being observed and the quantity equation (malnutrition). As long as ρ is not significant in any model, then λ is also not significant. The hypothesis of a bias present to selection problems in data is rejected.

[30] If the p-value is less than 0.05, then the null hypothesis of the Hausman test of systematic differences between the Fixed Effects (FE) and Random Effects (RE) model is rejected, and FE model is preferred.

Table No. 8

Determinants of malnutrition (Stunting)

Height-for-age z-score (*-100)	(1) Svy. Sampling	(2) FE	(1) Svy. Sampling	(2) FE
Age (months)	8.511***	8.690***	8.704***	11.07***
	(0.456)	(0.407)	(0.705)	(0.350)
Age (Sqr.)	-0.111***	-0.114***	-0.127***	-0.153***
	(0.00693)	(0.00653)	(0.0106)	(0.00560)
Wealth (Asset Ind.)	-3.019	-4.247	-9.337***	-11.94***
	(4.658)	(3.684)	(3.101)	(1.781)
Household size	-0.568	-0.866	4.264***	5.826***
	(1.164)	(0.943)	(1.275)	(0.801)
Mother educ.	1.303**	1.195**	-0.620	-1.324***
	(0.591)	(0.526)	(0.734)	(0.444)
Father educ.	-1.021**	-1.060***	0.772	-0.127
	(0.401)	(0.342)	(0.574)	(0.362)
Urban	-14.96**	-20.06***	1.700	1.303
	(6.702)	(4.765)	(6.750)	(3.954)
Male	14.60***	11.53***	6.502	2.947
	(3.758)	(3.490)	(4.465)	(3.006)
Health Insurance	3.862	-0.734	-17.54***	-18.06***
	(6.709)	(5.747)	(5.426)	(3.380)
Safe Water	6.519	4.795	9.075	5.691
	(8.576)	(6.123)	(8.267)	(5.032)
Proper sanitation	-4.776	-1.569	-25.25*	-7.659
	(8.069)	(6.452)	(13.20)	(8.710)
Indigenous	6.651	1.917	11.34	18.89***
	(8.187)	(6.928)	(8.455)	(4.476)
Afroecuadorian	-7.206	-14.36	-20.80**	-14.19*
	(11.48)	(9.135)	(9.919)	(7.897)
Others	4.247	2.129	23.81	-27.57
	(16.60)	(20.20)	(41.76)	(24.25)
Constant	3.107	11.15	11.44	-44.75***
	(14.99)	(12.27)	(19.01)	(12.42)
Observations	5,162	5,162	8,747	8,747
R-squared	0.115	0.118	0.081	0.143
No. of segments		51		72
Prob. > F of joint signif. of FE		0.0005		0.0000
Prob. > chi2 Hausman test		0.0024		0.0005
[a] Prob. > F Coeff. In 2012 are jointly diff. of 2004, F = 40.23				0.0000

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] Note: According to a pooled regression, the coeff. of 2012 are statistically different of 2004s. Individually (based on a t-test) only Afroecuadorians is not. Table No. 12 in the Appendix shows the pooled regression.

Source: Author's calculations

Surprisingly, mother's education is positive in 2004. That would suggest that after controlling for other individual, geographical and SES variables, in 2004 mothers with higher education have more malnourished children. A possible explanation for this could be that keeping else constant, more educated mothers had higher labor participation in the market in 2004 and then devoted less time to look after the children without any other private mechanism that replace it. This might happen by clusters, that is, within groups of the same social class (within poor or rich classes), more educated women devote more time to labor participation, affecting child health.

Nevertheless, in 2012 the effect of mother's education completely changed and got the expected negative sign, and is very significant. In 2004 an extra year of education of the mother is associated with 0.12 standard deviations more in malnutrition, while in 2012 it is reverted to 0.13 less standard deviations in malnourishment. The result of 2004 is unexpected and shows a different direction (if any) of mother's education on child health compared to previous research. The contrary happens with father's education, in both years it is negative but it is significant only in 2004. This induces to think that in Ecuador till 2004 it was more important the condition of the household head rather than the mother, provided that the father generally figures as such. In 2012 the father's effect vanishes and the mother's education effect widened to reduce child malnutrition. This change in parent's role on child health is striking. Changes in women's labor participation or intrahousehold bargaining might be reasons to explain this variation and deserves future research.

Furthermore, boys and children living in rural areas had systematically higher malnutrition. The sex and area effect disappeared in 2012. Besides, the presence of a comprehensive health insurance reduces malnutrition only in 2012. Regarding sanitation conditions, neither having access to safe water nor to a proper sewerage system have a systemic impact on child health in any year. This might happen given the widespread access to these utilities in Ecuador as was seen in the previous section; therefore health differences are rather explained by other environmental conditions. Nonetheless, having satisfactory sewerage system loses significance only after controlling for sector fixed effects. This would confirm that other unobserved characteristics of the sector were the individual lives are more important in explaining differences in height-for-age than having access to sanitation. Those facilities might be reflected with health care services.

When it comes to the ethnicity effect, the indigenous has always higher malnutrition whereas Afroecuadorians have lower compared to mestizos/whites. Nevertheless, the racial differences are statistically significant only in 2012 which is congruent with the more pronounced disparities observed in the descriptive statistics.

6.3. Robustness and consistency of estimators

The analysis presented above follows the postulates of a reduced form model for child health on the form of the Grossman model (2000). However, other considerations might be of interest. First of all, Deaton (2003) and Leigh et al. (2006) mention that not only the absolute level of income but also the relative level might matter for health status. Besides, Currie (2009) and Case and Paxson (2010) also determine that conditions during pregnancy affects child health. In this section, those considerations are included in the fixed effect model for child malnutrition determinants. Table No. 9 presents the results.

As it could be seen, the introduction of the variable "Rank", which measures the relative position in the income distribution, does not modify the coefficients of the other variables neither in 2004 nor in 2012. This confirms that the model is well specified. However, in 2012 once the variable Rank is incorporated, Wealth loses significance. This also suggests a transition from the absolute effect of income on health, to a relative effect (relative position in the SES distribution) between 2004 and 2012.

In addition, the incorporation of variables that measure conditions during pregnancy shows significance only in 2004. At the same time, in that year the mother's education, which previously reflected a (striking) positive and significant effect with malnutrition now loses significance. That means that in 2004 the effect of mother's schooling was absorbing the conditions during pregnancy, reflecting a direct effect between mother´s schooling and knowledge about child health.[31] On the other hand, in spite of birthweight, in 2012 the other pregnancy conditions are not significant and mostly keep the other coefficients invariant. Only health insurance and the dummy indicating being an Afroecuadorian lose significance. Being indigenous, although decreases its confidence level, is still significant. This suggest that in 2012 the presence of a more

[31] The variable Birthweight reflects the weight of the child at birth, Breast is a dummy variable indicating if the child was breastfed, Proper gestation is a dummy indicating if the pregnancy was normal and had the appropriate duration, # of Gestation controls indicate the number of controls received during pregnancy, and Child development Program is a dummy that indicates whether the children is beneficiary of any public program for children.

widespread health insurance is associated with better medical conditions and facilities that improves child health, and that once we control for those, the racial inequities either reduce or disappear. All these conditions support the hypothesis that in 2012 the relative position in the SES distribution, which is associated with better and higher access to health insurance and other facilities, affects health. When better conditions are more generalized in a population, is inequality rather than absolute income which affects the level of health. This is also reflected in the loss of significance of the urban/rural, male/female and ethnic gaps in 2012.

Table No. 9

Robustness checks for the determinants of malnutrition

	2004			2012		
VARIABLES	Original Malnutrition	(2) Malnutrition	(3) Malnutrition	Original Malnutrition	(2) Malnutrition	(3) Malnutrition
Age (months)	8.690***	8.717***	7.912***	11.07***	11.20***	11.92***
	(0.407)	(0.458)	(0.546)	(0.350)	(0.383)	(0.564)
Age (Sqr.)	-0.114***	-0.114***	-0.101***	-0.153***	-0.156***	-0.169***
	(0.00653)	(0.00661)	(0.00812)	(0.00560)	(0.00559)	(0.00914)
Wealth (Asset Ind.)	-4.247	4.150	-3.365	-11.94***	11.53	-6.622***
	(3.684)	(18.14)	(5.039)	(1.781)	(10.13)	(2.080)
Household size	-0.866	-0.930	-1.623	5.826***	5.839***	3.047
	(0.943)	(1.306)	(1.945)	(0.801)	(0.902)	(2.187)
Mother educ.	1.195**	1.244***	0.217	-1.324***	-1.311**	-1.479**
	(0.526)	(0.347)	(0.621)	(0.444)	(0.596)	(0.668)
Father educ.	-1.060***	-1.056**	-1.069**	-0.127	-0.348	-0.182
	(0.342)	(0.442)	(0.419)	(0.362)	(0.718)	(0.679)
Urban	-20.06***	-16.72**	-12.42*	1.303	1.321	-0.825
	(4.765)	(7.116)	(6.489)	(3.954)	(7.331)	(10.81)
Male	11.53***	11.68***	15.50***	2.947	4.512	7.915**
	(3.490)	(3.576)	(4.068)	(3.006)	(3.988)	(3.651)
Health Insurance	-0.734	-0.0445	7.126	-18.06***	-17.72***	-5.494
	(5.747)	(7.492)	(8.760)	(3.380)	(2.866)	(3.696)
Safe Water	4.795	3.296	-1.821	5.691	5.822	1.654
	(6.123)	(5.267)	(6.677)	(5.032)	(4.760)	(6.608)
Proper sanitation	-1.569	-1.521	-1.129	-7.659	-6.779	7.587
	(6.452)	(6.152)	(8.228)	(8.710)	(9.465)	(11.68)
Indigenous	1.917	4.204	7.665	18.89***	19.80***	15.02**
	(6.928)	(9.494)	(12.61)	(4.476)	(5.625)	(6.930)
Afroecuadorian	-14.36	-13.77*	-6.751	-14.19*	-20.45***	2.017
	(9.135)	(7.064)	(13.13)	(7.897)	(6.561)	(17.59)
Others	2.129	-0.636	-4.596	-27.57	-32.05	12.68
	(20.20)	(13.20)	(18.30)	(24.25)	(38.52)	(21.80)
Rank (Asset)		-22.30			-92.41**	
		(46.96)			(39.27)	
Birthweight			-0.246***			-0.0616***
			(0.0671)			(0.00706)
Breast (Suckled)			42.28***			16.09
			(15.81)			(21.82)
Proper gestation			-20.22***			1.941
			(5.832)			(5.420)
# Gestation ctrls.			-3.774***			-1.587*
			(0.515)			(0.900)
Child Dev. Prog.			0.719			4.278
			(5.453)			(5.018)
Constant		16.53	-24.75		-14.20	129.5***
		(30.02)	(28.75)		(20.18)	(34.63)
Observations	5,162	5,162	2,825	8747	8747	4,807
R-sqrd (overall)	0.117	0.117	0.133	0.147	0.145	0.182
Number of sector	51	51	51	71	71	67

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

6.4. Decomposition of the Concentration Index

After estimating the coefficient of average impact of each determinant of malnutrition, table No. 9 presents the decomposition analysis according to Eq. (5). As the reduced-form model showed robustness, this specification is used in the decomposition analysis.[32] The first decomposition method establishes that the contribution of each variable to the overall concentration index is given by the sensitivity of malnutrition to that variable (it's elasticity) times the socioeconomic inequality present in each explanatory variable, measured by its own partial CI. Through this methodology it is possible to observe which variables are driving the SES-related inequality, and beyond that, be able to determine inequities in health, understood as the amount of health inequality that is not due to standardizing by demographic variables, namely the unexplained inequality.

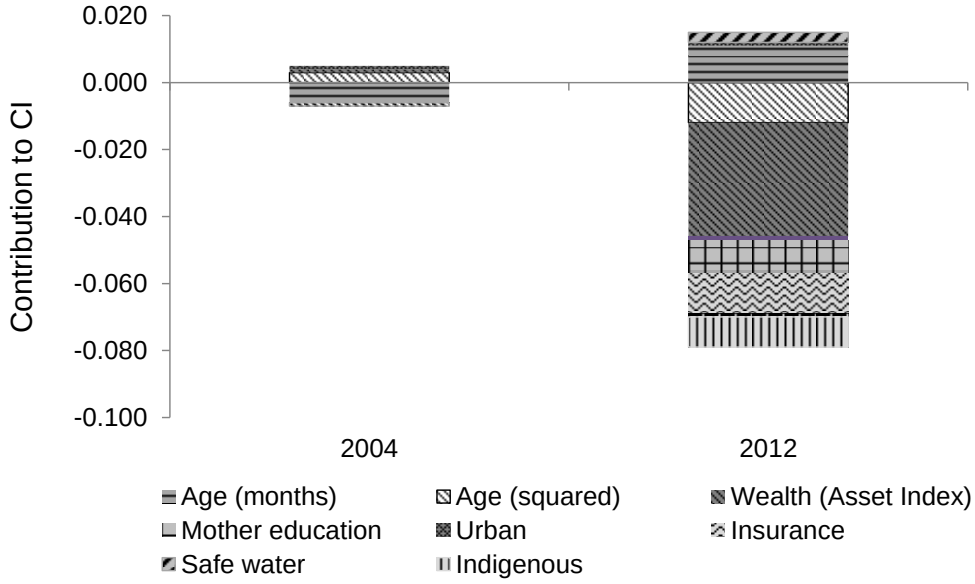
Results indicate that in 2004 health inequality is basically explained by demographic/standardized determinants (age, sex and household size). Considering only age-based disparities in health it accounts for 58% of the inequality in that year (84% including sex and household size). The wealth differences explained only 11% of health inequality and other 10% is explained by parent's education inequality. Besides, in 2004 inequities/unjustified inequalities explained 11.7% of the total health inequality.

In 2012 results are different. As it was seen in the regressions, in that year the impact of wealth, mother's education and the presence of health insurance is higher and very significant. All of those are features characterizing higher SES. Congruent with this fact, in 2012 the inequity, namely the explanation of health inequality coming for variables beyond demographic standardization explains 97% of child health differences. Demographic differences do exist also in 2012 but their overall effect is offset by the different variables (age, squared age, gender). On the other hand, that year merely wealth inequality explains 96% of the concentration index, whose effect is seen reduced only by a more pro-poor distribution of sanitation, safe water and more even distribution of health across urban and rural areas, but reinforced by the significant effect of a health insurance and its concentration in favor of the rich.

[32] That is, the one that uses wealth instead of Rank, and does not use pregnancy conditions.

Graph. No. 9

Decomposition of the Concentration index, 2004-2012



Source: Author's calculations

Nevertheless, this approach lacks the possibility to disentangle the changes in health inequalities across the years and if this change is due to implicit variations within elasticities. A change in the elasticity could be done to changes in the coefficient or the mean of the variable. Besides, both the coefficient and the mean could increase the inequality. This is what the total decomposition does, and is computed by Eq. (6). It is noteworthy that as a method relying on total differentiation, this holds for small changes. Results are present in Table No. 13 in the appendix. It shows that most of the variation is due to changes in the means and the partial CIs of the variables, and confirm the fact important increases in variables heavily concentrated such as wealth, health insurance and mother's education are the basic drivers. Moreover, also highlights the worsening condition of the indigenous.

Table No. 10

Decompositions results for the Concentration Index, 2004-2012

	Coefficient (a)		Elasticity (b)		Concentration Index (c)		Contribution (d) = (b)*(c)	
	2004	**2012**	**2004**	**2012**	**2004**	**2012**	**2004**	**2012**
Age (months)	8.690***	11.07***	2.042***	3.247***	-0.003	0.004	-0.006	0.011
Age (squared)	-0.114***	-0.153***	-1.077***	-2.13***	-0.003	0.006	0.003	-0.012
Wealth (Asset Index)	-4.247	-11.94***	-0.001	-0.076***	-0.364***	0.842***	0.001	-0.034
Household size	-0.866	5.826***	-0.034	0.255***	0.005***	-0.004*	0.000	-0.001
Mother education	1.195**	-1.324***	0.081**	-0.008***	-0.004***	0.125***	0.000	-0.001
Father education	-1.060***	-0.127	-0.047***	-0.091	-0.006***	0.128***	0.000	-0.009
Urban	-20.06***	1.303	-0.08***	0.007	-0.01***	0.192*	0.001	0.001
Male	11.53***	2.947	0.043***	0.012	-0.017	0.01	-0.001	0
Insurance	-0.734	-18.06***	0.000	-0.059***	0.007**	0.209***	0	-0.012
Safe water	4.795	5.691	0.024	0.042	-0.005*	0.069	0.000	0.003
Satisfactory Sanitation	-1.569	-7.659	-0.007	-0.062	-0.006**	0.019*	0.000	-0.001
Indigenous	1.917	18.89***	0.002	0.020***	0.019***	-0.442***	0.000	-0.009
Afroecuadorian	-14.36	-14.19*	-0.003	-0.005*	-0.023**	-0.096*	0.000	0.000
Others	2.129	-27.57	0.000	-0.001	0.028	-0.119	0.000	0.000
TOTAL							**-0.002**	**-0.064**
CI							-0.00453	-0.0665
Regression error							-0.003	-0.003
Inequity/Unjustified inequality							-0.001	-0.065
Inequity as % of total CI							11.7%	97.0%

*** p<0.01, ** p<0.05, * p<0.1

Note: The elasticity corresponds to $\beta_X * \frac{mean(X)}{mean(haz)}$.

Source: Author's calculations

7. Conclusions

Previous research on inequality in Ecuador and Latin America (LA) is centered around income inequality, neglecting the need to assess the structural conditions affecting outcome disparities. When it comes to child health in Ecuador, previous research has focused on either assessing the relation of mortality rates with SES or determining trends of malnutrition. In that sense, the present paper is the first attempt to measure the SES-related child health inequalities in Ecuador during the last decade. As confirmed by previous research, malnutrition has reduced in Ecuador but the reduction is not evenly distributed.

In fact, the distribution of child malnutrition has become more unequal between 2004 and 2012 affecting in higher levels the poorest segments of the population. The first evidence to confirm this is that the Concentration curve of malnutrition in 2012 stochastically dominates the 2004s. For some groups, such as the first quintile and the indigenous people, malnutrition has worsened. For the rest of the SES distribution, child health has improved on average. The more unequal distribution of malnutrition across the wealth gradient has caused the achievement index to increase more rapidly in 2012 compared to 2004. This index measures the average level of malnutrition adjusted by inequality, so confirms the fact that beyond averages, malnutrition has moved disproportionally towards the worse-off.

Regarding the determinants of malnutrition two trends are observed. First, the effect of the location conditions in which the individual lives has vanished between 2004 and 2012, reflected in the reduction of the urban/rural gap, the reduction of the impact of sanitation and the persistent insignificance of the access to safe water. This result also comes with the evidence of more spread access to those services in 2012 compared to 2004. However, other unobserved characteristics, where probably the availability of other health facilities and different infrastructure services are relevant, are still important in both years, reflected by the significance of controlling for sector fixed effects.

The second trend is the increase of the impact of SES variables such as wealth, parent's education and access to health insurance on malnutrition. The regression results show that in 2004, mother's education was the most important SES variable in determining

child health. This was confirmed when the introduction of prenatal and gestation controls were introduced and the effect of mother's education disappeared and father's education decreased in 2004, confirming the fact that access to health utilities, medical care and knowledge about child health was strongly correlated with parent's education. This shows that access was clustered in fewer households in that year and that supply constraints affected health disparities the most. On the other hand, in 2012, where access to health facilities have increased substantially, particularly sanitation and health insurance, the impact of gestation control variables (if any) was not significant and maintained invariable the coefficients and significance of parent's education. In that year, it was not access, but the presence of insurance and wealth the determinant variables. Particularly, when the variables related to gestation controls and pregnancy were introduced, it was the variable of health insurance the one that face variations, not the others. Health insurance appeared to be the driver in quantity or quality of access to health services in 2012. Besides, once we control for variables that proxy access, the ethnic gap narrowed. This is evidence of a transition from the absolute and protective effect of income, to the relative effect of income on health.

In environments of a generalized constraint of access to minimum infrastructure and health services, it is precisely the condition of having or not that access which affects health. That is also why in 2004 the urban/rural was significant. When average access increases, it is the relative position in the SES-distribution which matters for health status. This was confirmed when the incorporation of the variable "Rank", indicating the position of the individual in the overall distribution, was significant only in 2012 and its introduction converted the variable "wealth" into not significant.

Moreover, the deepening of the SES-health gradient in 2012 is also observed throughout the decomposition of the Concentration Index. In 2004, about 84% of the index was explained by demographic variables, wealth contributed with 11% and parent's education with 10%. In addition, in this year the urban-rural gap was clearly more marked. On the other hand, in 2012 almost 100% were explained by wealth and parent's education, the increasing effect of those variables were somewhat counteracted by the reduction of the urban-rural gap, more pro-poor access to basic services and lower effect of age.

The worsening conditions in the SES-related health inequality are an unexpected result given the path-breaking investments the government have been carrying on health since 2007. It could be thought that the great share of those investments were devoted to adult health improvements, or that the expenditure has been regressive, but that explanation deserves future research and goes beyond the scope of the present thesis. Additionally, congruent with the evidence that in 2004 the absolute hypothesis was more relevant, it could be possible that as long as average income increases and poverty goes down, the poorer children that otherwise would die now are surviving. More vulnerable children are now members of the malnutrition indicators. The reduction in mortality causes that additional children from lower SES are now compared with better-off individuals, turning it clearer the SES-health-gradient disparities. This might be what happened in Vietnam during the 90s, when this country experienced important welfare improvements and SES-related malnutrition increased (Wagstaff et al., 2003). The same is found by Paraje (2008) for several Latin-American countries when argues that the higher the SES inequality, the more concentrated is chronic malnutrition amongst the poorer in the region. The Dominican Republic, a country with a relatively lower SES inequality presents at the same time lower child health malnutrition disparities.

The increase in the SES-related health inequalities and the evidence that indigenous are worse-off supports the conclusion that inequality of opportunities among child health has deteriorated. This is because not only SES, but race and parent's background is beyond the control of the child. Furthermore, provided the SES inequality of health has increased and that some groups such as the indigenous have seen declined its health outcome is a first clue of an inequality trap, a topic that deserves future research, and which foresees that the structural income inequality in the future will be persistent.

The essential relation of health conditions with human capital accumulation put forward by the recent literature; make it basic for Ecuador, and for Latin America as a whole to generate equitable policies to promote early child development. It is not only ethically desirable, but seems as a cost-effective way of solving inequality traps in the most unequal region in the world. High child health inequality will cause persistent differences in educational attainment across different SES, and therefore will keep income inequality at present levels. The Ecuadorian and LA governments should not only focus on tackling average levels of mortality and malnutrition. The aim of policies should also go to

reduce inequality, provided the fact that while the economy grows, a higher average income might be hiding higher malnutrition disparities while poorer children achieve to survive. Besides, the desired improve in average levels of human capital that the country and the region require to achieve a structural change to boost sustained economic growth, first passes by the need to guarantee adequate levels and evenly distributed conditions of child health that later on would allow to boost schooling and improve labor and income outcomes. Narrowing child health inequalities will help in reducing income inequality, and therefore will increase the poverty elasticity of growth.

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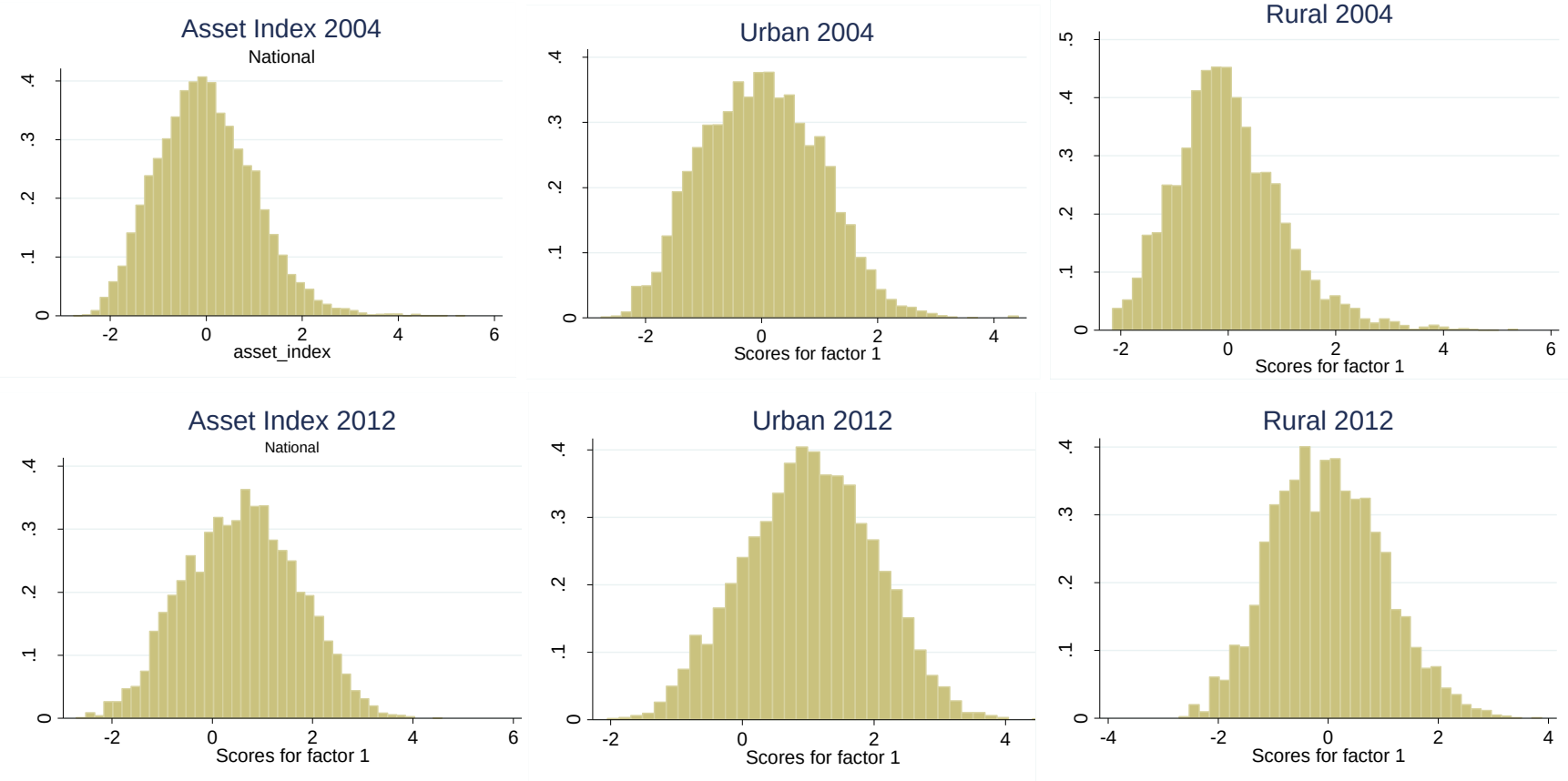
9. APPENDIX

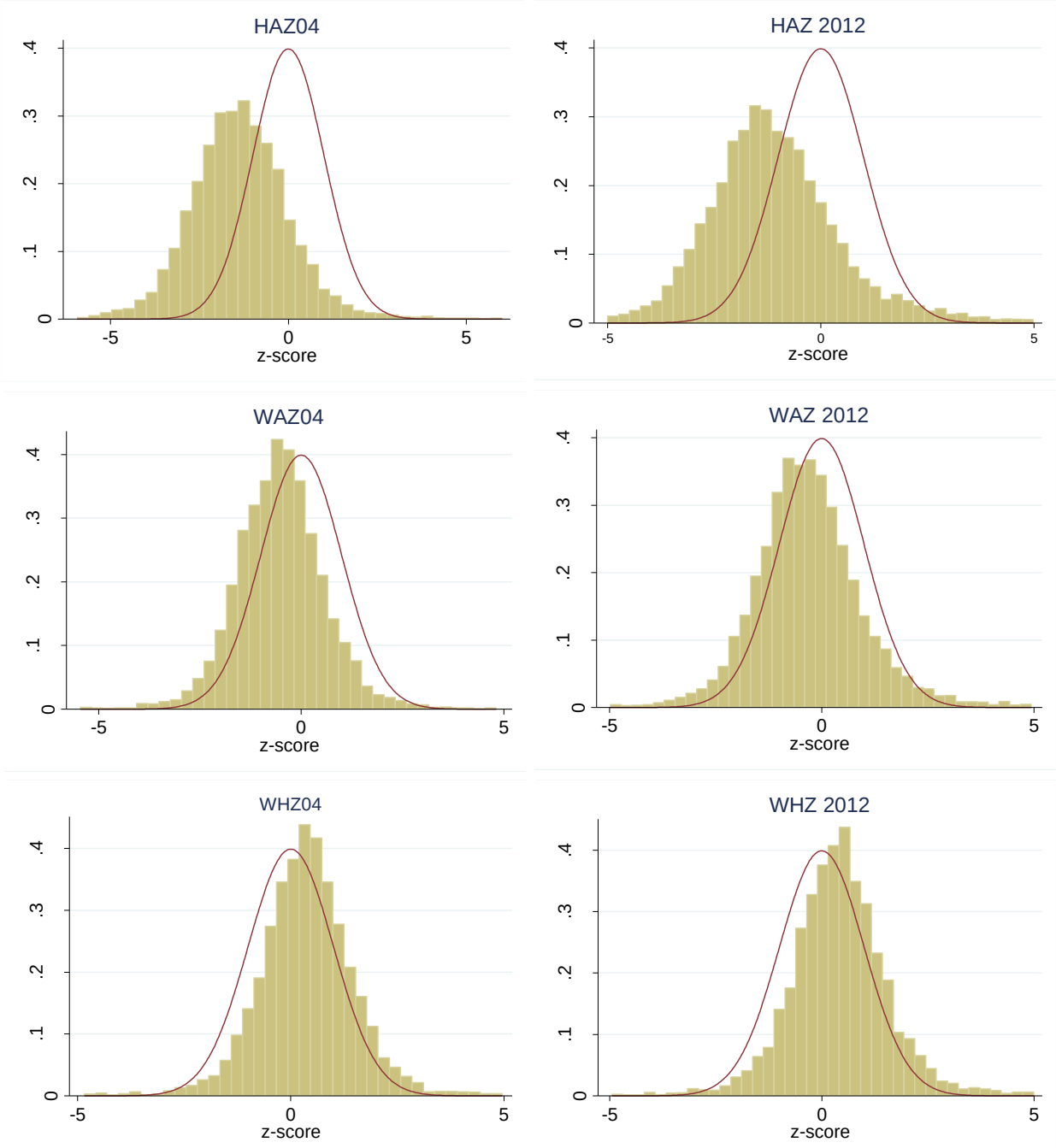
Graph. No. 10

Wealth index (Asset Index)



Graph. No. 11

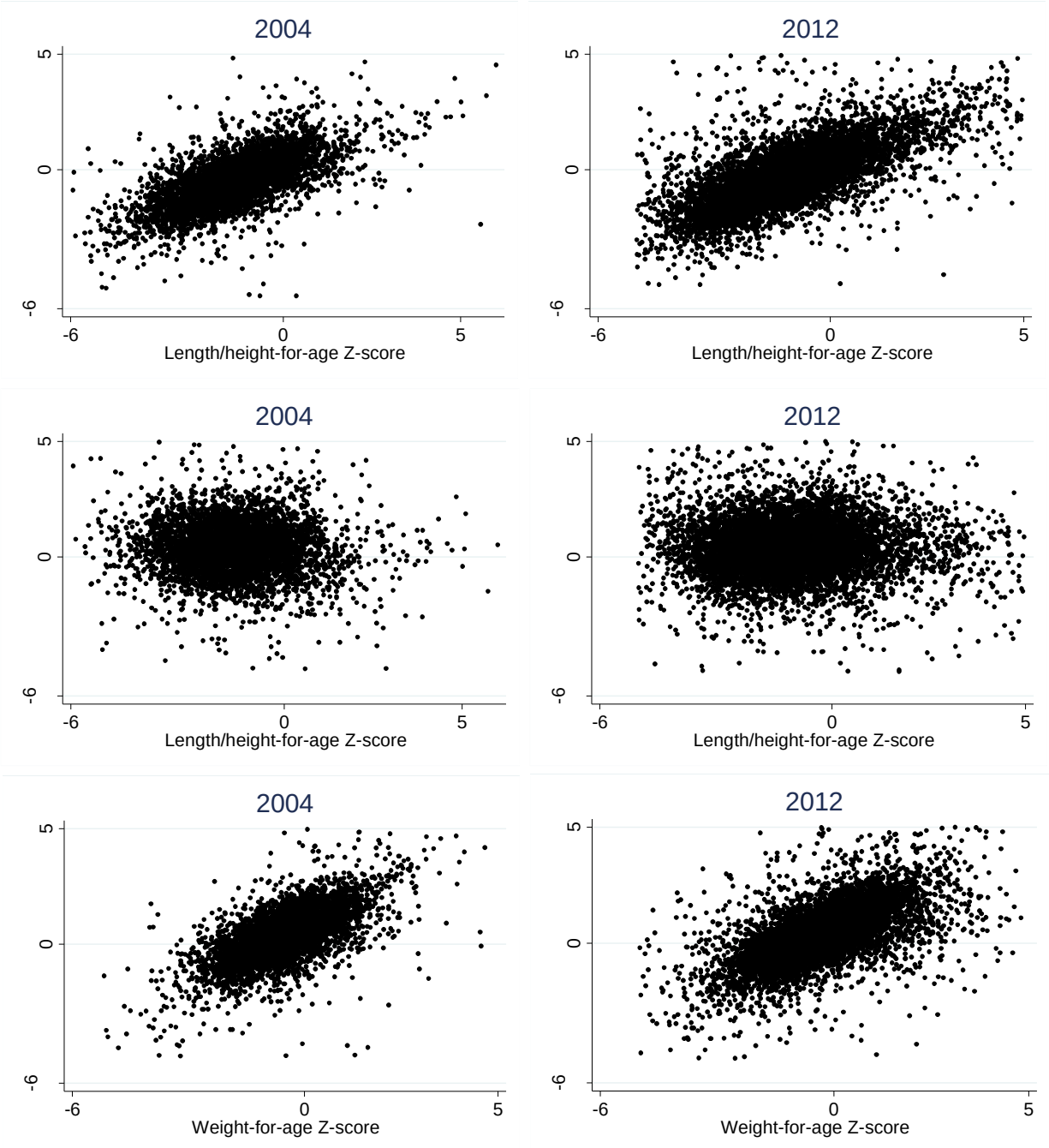
Distribution of z-scores in Ecuador, 2004 and 2012



Source: Author's calculations

Graph. No. 12

Correlation between different anthropometric indicators in Ecuador , 2004 and 2012



Source: Author's calculations

Table No. 11

Heckman selection model (Quantity Equation - Malnutrition-)

Height-for-age z-score (*-100)	(1) 2004	(1) 2012
Age (months)	7.098***	8.715***
	(1.056)	(0.730)
Age (Sqr.)	-0.0871***	-0.127***
	(0.0165)	(0.0112)
Wealth (Asset Ind.)	9.799	-8.988***
	(12.31)	(3.137)
Household size	-4.185	4.182***
	(5.842)	(1.296)
Mother educ.	0.265	-0.516
	(2.074)	(0.746)
Father educ.	0.709	0.680
	(1.600)	(0.581)
Urban	-12.39	0.724
	(16.86)	(6.849)
Male	8.017	6.602
	(9.341)	(4.545)
Health Insurance	-0.710	-17.34***
	(19.11)	(5.549)
Safe Water	27.70*	8.124
	(16.65)	(8.436)
Proper sanitation	-13.06	-24.48*
	(19.54)	(13.71)
Indigenous	-0.911	11.15
	(19.49)	(8.588)
Afroecuadorian	3.463	-20.23**
	(29.27)	(9.942)
Others	13.01	24.78
	(48.76)	(41.65)
Constant	246.6***	11.51
	(71.12)	(19.60)
athrho (ρ)	**-0.634**	**0.0561**
	(0.472)	(0.123)
lnsigma (σ)	4.827***	4.945***
	(0.118)	(0.0139)
Observations	5162	8,747

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

Table No. 12
Pooled regression for malnutrition determinants (2004 and 2012)

VARIABLES	Original Malnutrition	Robustn. Malnutrition	[...continued]	Original Malnutrition	Robustn. Malnutrition
			2012 (year=2012)	-53.36***	
				(15.27)	
Age (months)	8.747***	7.881***	2012 × Age	2.454***	4.024***
	(0.468)	(0.547)		(0.492)	(0.566)
Age (Sqr.)	-0.115***	-0.101***	2012 × Sqr. Age	-0.0409***	-0.0679***
	(0.00674)	(0.00816)		(0.00803)	(0.00927)
Wealth (Asset Ind.)	-2.656	-3.505	2012 × Wealth	-8.828*	-2.774
	(4.577)	(5.013)		(4.948)	(5.847)
Household size	-0.780	-0.990	2012 × HH size	6.498***	4.060*
	(1.316)	(2.058)		(1.335)	(2.396)
Father educ.	-1.074**	-1.091**	2012 × Fath. Educ	0.728	0.808
	(0.446)	(0.421)		(0.738)	(0.663)
Mother educ.	1.102***	0.190	2012 × Moth. Educ	-2.504***	-1.605**
	(0.374)	(0.605)		(0.516)	(0.622)
Urban	-16.05**	-14.61**	2012 × Urban	14.86	12.67
	(7.460)	(6.009)		(9.954)	(12.35)
Male	11.81***	15.38***	2012 × Male	-6.858	-6.807
	(3.466)	(4.089)		(5.171)	(5.061)
Health Insurance	1.206	7.352	2012 × Health Insur.	-19.85**	-12.83
	(7.528)	(8.789)		(8.270)	(9.328)
Safe Water	4.489	-0.119	2012 × Safe water	1.528	2.682
	(4.877)	(6.725)		(6.574)	(7.723)
Proper sanitation	-0.653	-0.461	2012 × Sanitation	-5.575	4.552
	(5.642)	(7.697)		(9.110)	(13.87)
Indigenous	3.574	8.835	2012 × Indigen.	16.28**	7.676
	(9.448)	(13.98)		(6.788)	(11.66)
Afroecuadorian	-13.77**	-7.849	2012 × Afroecuad.	-7.653	9.348
	(6.869)	(13.39)		(9.652)	(22.90)
Others	-3.645	-5.605	2012 × Others	-29.12	17.35
	(13.63)	(19.12)		(41.58)	(17.82)
Birthweight		-0.239***	2012 × Birthweight		-0.301***
		(0.0673)			(0.0687)
Breast (Suckled)		-43.88***	2012 × Breast		-26.92
		(15.89)			(31.19)
Proper gestation		-20.06***	2012 × Gestation		21.98**
		(5.873)			(8.958)
No. Gestation ctrls.		-3.718***	2012 × Controls Gest.		2.120*
		(0.499)			(1.123)
BDH		-4.862	2012 × BDH		84.95
		(8.042)			(53.30)
Child dev. Prog.		0.303	2012 × Child Dev. Prog.		4.090
		(5.320)			(7.507)
Constant				7.684	-28.18
				(13.84)	(29.64)
Observations				12,770	6,632
R-squared				0.142	0.167
Number of sector				78	75

Robust standard errors in parenth
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

Table No. 13

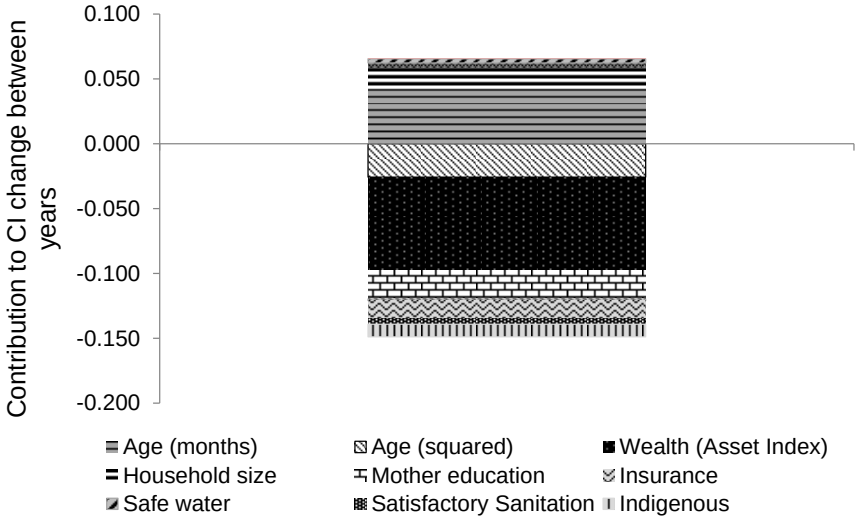
Total decomposition for changes in child health inequality between 2004 and 2012

Variable	β's	Means of x's	CIs	Total
Age (months)	0.039	-0.012	0.014	0.042
Age (squared)	-0.026	0.010	-0.009	-0.026
Wealth (Asset Index)	0.001	-0.049	-0.024	-0.072
Household size	0.015	0.001	0.000	0.017
Mother education	-0.031	0.001	0.010	-0.020
Father education	0.008	0.000	-0.009	-0.001
Urban	0.022	0.000	-0.019	0.004
Male	-0.003	0.000	0.001	-0.001
Insurance	-0.004	-0.010	0.000	-0.014
Safe water	0.001	0.000	0.003	0.003
Satisfactory Sanitation	-0.003	0.000	0.000	-0.004
Indigenous	-0.005	-0.004	-0.001	-0.010
Afroecuadorian	0.000	0.000	0.000	0.000
Others	0.000	0.000	0.000	0.000
Residual				0.000
Total	**0.014**	**-0.063**	**-0.034**	**-0.083**
Column as % total	-16%	76%	41%	
Actual change				**-0.0620**

Source: Author's calculations

Graph. No. 13

Contribution of each variable to total change in child health inequality between 2004 and 2012



Source: Author's calculations