

Determinants of Child Health Inequalities in Developing Countries: a New Perspective

Ignacio Amate-Fortes¹ · Almudena Guarnido-Rueda¹ · Agustin Molina-Morales¹

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Abstract This essay analyzes the determining factors in the differences in child health. To achieve this, we present a cross-sectional model for 88 developing countries, using two measures of child health inequalities: the infant mortality rate by wealth quintiles and the infant mortality rate by maternal educational level. We conclude that a lower inequality in the distribution of income, greater public health expenditures, and the introduction of capitalism in these countries decrease inequalities in health.

Keywords Child health inequality · Inequality in income · Institutionalism · Developing countries · Health expenditure

The interest in analyzing the inequality in health has grown in the last three decades, although there is not much literature which analyzes the determining factors of that inequality through a comparative study among countries. There are many published works that show a greater interest in analyzing the measurement of inequality in health rather than in studying its causes.

This essay is intended to answer one main objective. It analyzes the determining factors of child health inequality in developing countries. To achieve this, we have employed two different indicators of the inequality in health which implies a novel aspect, since it uses the infant mortality rate by wealth quintiles and the infant mortality rate by educational maternal level. In order to analyze its causes a cross-sectional model for

88 developing countries has been estimated. In addition to the traditional explanatory variables such as income, inequality of income, poverty, public health expenditure or the education of women, we have incorporated other types of factors like the institutional variables that can respond to issues such as, whether capitalism reduces or increases the inequality in health.

The estimates carried out allow us to conclude that the greater the inequality of income, the greater the inequality in health is. On the other hand, a higher public health expenditure and the promotion of capitalism, measured through the Index of Economic Freedom, reduce this outcome.

Our work is structured in the following way: First we will present a revision on the main works carried out in this field. We will then explain the model and variables used and the empirical results obtained. Finally, we will present the main conclusions on the basis of the assessment made.

Since the 1980s the interest of researchers in inequalities in health has increased. However, many of these studies have focused primarily on analyzing national health surveys without developing comparative analyses among various countries. In addition, these works have mostly studied the cases of Great Britain and the United States. These works include those of Arber and Lahelma (1993), who carried out an analysis of gender inequalities in health. For their part, Wagstaff and Van Doorsaler (1994), argued that the index of concentration is sometimes not applicable to this type of study. Subsequently, Etner (1996) related the income of households to health. On the other hand, Wagstaff et al. (2001) carried out an analysis of the effects that the health-related behaviors has on the inequality. In addition, Houweling et al. (2003) evaluated the influence that economic status has on the inequality in health. Hernández and Jiménez (2009) later showed the importance of economic status as a relevant factor which explains the differences in health in Spain. On the other hand,

✉ Ignacio Amate-Fortes
iamate@ual.es

¹ Department of Economics and Business, University of Almería, Carretera de Sacramento s/n, 14120 Almería, Spain

Chatterji et al. (2013) used as an explanatory variable in health inequality a relative index of income inequality income which shows that the main determinants of inequality in health are level of income and maternal education. Nolan and Layte (2014) came to the same conclusion also using family income and maternal education as the principal explanatory variables of the inequality in children's health in Ireland.

Another strong trend in this field of study has been the interest that some authors have shown finding suitable measurements of inequality in health, since, as noted in López-Casasnovas and Rivera (2002), the measurement of health status shows major problems due to the lack of a complete and comparable health index among countries and regions. In this way, Borrell et al. (2000) made a classification of different measurements of inequality depending on the addition or not of the socio-economic level in the analysis, the availability of individual or aggregated data, measurement of effect or total impact, and relative or absolute measurements. Sahn and Younger (2009) used the BMI as a measurement of inequality in intra-household health. On the other hand, it is highlighted Tang et al. (2009) using the variable “realization of potential life years” (age at death / potential length of life) as a measurement of inequality in health. The goal is to separate the avoidable risks of mortality from the unavoidable ones. Ho and Slavov (2012) offered an alternative perspective on inequality in health. Instead of studying this inequality among socio-economic groups, they performed an analysis of inequality in existing health care within each one. To do so, they used as a measurement of inequality the life length, which decreased during the last century despite increasing the inequalities of income.

Among the pioneering works we can find those of Le Grand (1985, 1987), who related inequality in health with human capital; Parkin et al. (1987), who analyzed the relationship between the public budgets in health and the GDP of the countries; Pamuk (1988), who relates the inequality in health to the economic inequality between the different social classes; and Leclere (1989), who performed a comparative survey between European countries. All of them used the mortality and the life expectancy indexes as health indicators, which allow for comparative analysis among countries, but as López-Casasnovas and Rivera (2002) pointed out, these indicators are not sensitive to improvements in quality of life, something which is essential in the most developed countries which have already reached high levels of health. Yet, as Arokiasamy and Pradhan (2010) shows, the assessment of the inequalities in health with comparative analysis of their determinants is crucial for drawing up agendas dedicated to the health policies. King et al. (2013) analyzed which countries have as a priority to reduce the inequality in health and how such prioritization is due to socio-economic factors. These authors come to the conclusion that those countries with

the largest PIB are the ones which prioritized more the fight against inequality in health, supporting the thesis of Gakidou et al. (2003).

In addition to the relationship between income and distribution, education and inequality in health, and the size of the health services and their impact on the observed differences in health indicators, studies of gender have also been carried out like the aforementioned ones by Arber and Lahelma (1993) and Borrell and Artazcoz (2008). On the other hand, Gatrell et al. (2004) performed a spatial analysis of inequality in health, showing how geographical inequalities also affect health outcomes.

Other determining factors that have been used in the economic literature have been variables related to the labor market such as the workplace and the lack of or absence of employment (Dalghren and Whitehead 1991). Because labor risks and psychological stress affect a healthy lifestyle as noted in Mackenbach and Bakker (2002), esteem and social approval depend largely on the kind of jobs that people have. The environment has also been referred to as determinant. Access to basic sanitation, clean water and waste disposal have been taken into account in such studies (Dalghren and Whitehead 1991; WHO 2009).

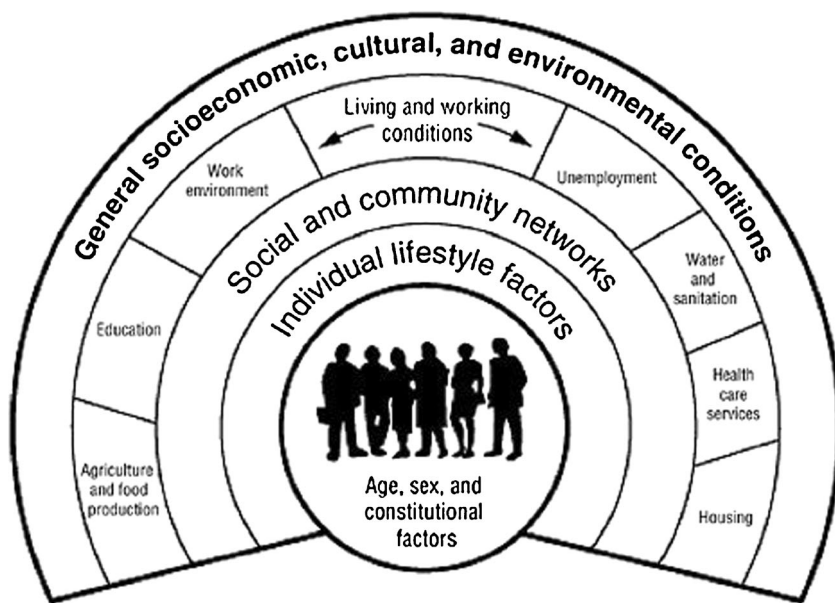
Many authors have studied the causes of health and health inequalities of children. Flegg (1982) states that inequality of income, level of education of women and the number of physicians and nurses per capita are the main determinants of child mortality. Marmot (2005) argues that infant mortality varies among countries as well as within each country as a result of the effect of the social gradient. Rajmil et al. (2010) proposed a series of public intervention measures to reduce the effects of poverty and social exclusion on children's health.

We intend to deepen the analysis of the determinants of inequality in health through a comparative study of 176 countries up until 2013. There are two goals: on the one hand, to analyze how important the indicator of inequality in health that is chosen and on the other hand to analyze the effect that different determinants of inequality in health have by introducing institutional variables as explanatory variables in this type of analysis.

Method

We adapt to classic model of Dalghren and Whitehead (1991) to conduct a comparative analysis among 88 developing countries. Their model has been widely used and shows the determinants of health in concentric layers, from the structural determinants (outer layer) to the individual lifestyles (inner layer), being placed in the center the characteristics of the people which cannot be modified such as sex, age, or constitutional factors (Fig. 1).

Fig. 1 The dalghren-whitehead model of determinants in health. Source: Dalghren and Whitehead (1991)



According to these authors, individuals have risk factors such as age, sex and other genetic factors which affect their potential to achieve good health. Included also are personal behavior and lifestyle. People with an unfavorable economic status tend to exhibit behaviors that deviate from healthier lifestyles, such as smoking, alcohol abuse, drug abuse and poor nutrition. At the same time labor and environmental condition and access to basic services constitute another set of determinants of health status. Differences in the habitability of housing, occupational risks, employment, and the possibility of having a free, quality education and basic sanitation services and accessible infrastructures that provide drinking water, sewage disposal, and paved roads are all key factors that produce differences in health in different social groups. Finally, the economic, cultural and environmental conditions prevalent in society as a whole, as well as the economic situations in each country will also affect health outcomes of a population.

This analysis uses two new indicators: the infant mortality rate by wealth quintiles and the infant mortality rate by

maternal educational level. These indexes aim to provide an overview on inequalities in health both within and among countries.

The infant mortality rate by wealth quintiles is the result of the following expression:

$$\text{Mortality} \left(\frac{20}{80} \right) = \frac{\text{Under 5 mortality rate Q1}}{\text{Under 5 mortality rate Q5}} \tag{1}$$

Where, Q1 represents the 20 % poorest population and Q5 the 20 % richest population. The ratio 80/20 is used to study the inequality in income distribution. We use the ratio 20/80 in order to obtain a positive measurement in relation to health inequality, that is, the higher the ratio the greater the child health inequality is.

Likewise, the infant mortality rate by maternal educational level is derived from the following equation:

$$\text{Mortality}(\text{edu}) = \frac{\text{Under 5 mortality rate}(\text{None maternal education})}{\text{Under 5 mortality rate}(\text{Secondary or higher maternal education})} \tag{2}$$

The data of both dependent variables have been obtained from the World Health Survey.

Dalghren and Whitehead (1991) model has been adapted to analyze the determining factors of child health inequality using a cross-sectional model for 88 countries.

The following independent variables have been used in this linear model:

- **Gini Index** is an indicator of inequality in the distribution of income.

- **GDP per capita** measured in PPP terms in constant \$.
- **Poverty** measured by the mean shortfall from the poverty line (counting the non-poor as having zero shortfall) expressed as a percentage of the poverty line.
- **CO2 emissions** (metric tons per capital) used as a proxy variable of the environmental conditions of the country in question.
- **Rural population** represents the percentage of population living in rural areas.
- **Parliamentary** measures the percentage of women who are parliamentary in a single or lower chamber and it is a proxy variable of the role of women in the society of the country in question.
- **Public health expenditure**, measured as a percentage of the GDP.
- **Physicians**, measured by the number of physicians per 10,000 inhabitants.
- **Education** is a proxy variable for the educational level of women in the country in question through the number of years spent at school by women.
- **Unemployment** is the unemployment rate.
- **Rural water** reflects the percentage of population using an improved drinking water source.
- **Crime** is the number of homicides for each 100,000 inhabitants. The source used is the United Nation Office on Drugs and Crime.
- **Globalization** is measured by the KOF Index of Globalization. It measures the global connectivity, integration and interdependence of countries in cultural, ecological, economic, political, social and technological spheres. This index is prepared by KOF Swiss Economic Institute.
- **Democracy** is measured by the Political Right Index. This index, elaborated by the NGO *Freedom House*, includes evaluations of free and impartial elections, plurality of political parties, significant opposition, military regimes and self-determination for minority groups.
- **Capitalism** is measured by the Index of Economic Freedom. It includes evaluations of trade policies, Government tariffs, Government intervention in the economy, monetary policy, flow of capital and foreign investment, foreign activity, financial activity, price and wage control, property rights and black market activity and regulation. The Heritage Foundation of Wall Street Journal elaborates this index.
- **Life expectancy** is used as a proxy variable of the health status of the population by the simple fact of being born and living in the country in question.

The source for all the variables used, with the exception of “crime” and institutional variables, is the World Development Indicators published by the World Bank.

Table 1 Results of the estimations

	Mortality (20/80)		Mortality (education) ^b	
	MCO	2SLS ^a	MCO	2SLS ^a
Gini index	2.83 (2.45)**	6.94 (3.07)***	4.33 (1.92)*	4.89 (1.84)*
GDPpc	0.0005 (0.98)	-0.00005 (-0.09)	0.00002 (0.23)	
Poverty	-0.003 (-0.29)		-0.02 (-1.19)	
CO2	0.05 (0.62)	0.05 (0.57)	0.16 (1.08)	0.04 (0.41)
Rural population	0.004 (0.64)	-0.0004 (-0.05)	0.01 (1.14)	
Parliamentary	-0.002 (-0.26)	0.002 (0.20)	-0.004 (-0.34)	0.002 (0.12)
Public health expenditure	-0.13 (-1.95)*	-0.23 (-2.63)**	-0.02 (-0.21)	-0.09 (-0.84)
Physicians	-0.25 (-2.07)**	-0.11 (-0.74)	-0.20 (-0.53)	-0.19 (-0.62)
Education	-0.00008 (-0.00)			
Unemployment	-0.02 (-0.97)		-0.06 (-1.48)	
Rural water	0.003 (0.56)	0.004 (0.62)	-0.01 (-0.95)	-0.001 (-0.11)
Crime	-0.01 (-2.23)**	-0.02 (-2.82)***	-0.02 (-2.21)**	-0.02 (-2.21)**
Globalization	0.03 (2.63)**	0.03 (1.99)*	0.02 (1.04)	0.007 (0.34)
Democracy	-0.03 (-0.56)	0.003 (0.04)	-0.03 (-0.42)	0.01 (0.17)
Capitalism	-0.03 (-1.94)*	-0.06 (-2.70)**	-0.04 (-1.42)	-0.05 (-2.02)**
Life expectancy	0.02 (1.51)	0.03 (1.86)*	0.04 (2.02)*	0.04 (2.74)***
Observaciones	42	42	42	42
R ²	0.98		0.93	

* Significant at 10 % ** Significant at 5 % *** Significant at 1 %

^a Gini index is used as instrumented variable

^b Education is dropped because is used to calculate the dependent variable

The model has been estimated by Ordinary Least Squares (OLS) and by Two Stage Least Squares (2SLS) and the empirical results are collected in the following table (Table 1).

Many authors have pointed out that more than absolute income, it is the difference in income which determines to a greater extent inequality in health (Duleep 1995; Wilkinson 1996; Deaton 1999). This fact is corroborated here since the Gini index is significant in all the estimates. The positive sign shows that the inequality in the distribution of income has a direct and significant effect on child health inequality, that is to say, countries where the income inequality is greater, inequality in health is also more marked. However, the effect of absolute income measured by per capita GDP is not significant in all estimates. So, in the case of developing countries, the absolute income doesn't explain the inequalities in child health. Indeed, the child health inequalities in developing countries depend on how the income is distributed among the population.

Poverty has no effect on inequality in health. It is due to the sample used because we are studying child health inequality observed in developing countries. These countries are very poor, and so, poverty is a common to them all. Likewise, the social, cultural, demographic, and environmental conditions show, in the majority of cases, a similar result. Only the public expenditure on health and the density of physicians have a significant effect on this inequality. In terms of public expenditure on health, the effect is the expected one. Thus, the significant and negative sign indicates that the bigger the public intervention in health is, the lower the inequality. In other words, the public sector reduces the inequality in health. This result coincides with that obtained by Wagstaff and Van Doorsaler (1993). A similar result is obtained with the independent variable that measures the number of physicians in the country in question. The effect of this variable on inequality is negative, so the larger the number of physicians, the lower the inequality. Therefore, the improvement of the needed infrastructures and human capital in health through greater public health expenditure is a key element in reducing child health inequalities in developing countries.

The environmental variable used does not support any significant results. CO₂ emissions, in other words, pollution does not cause greater inequality in health. The same conclusion appears in the case of the unemployment variable. The lack of employment does not affect inequality in health. Essential infrastructures do not play a fundamental role in health inequalities either. Even so, the non-significant sign for the variable that measures the percentage of rural population having access to drinking water does not allow the claim that the impoverishment of living conditions in rural populations reduces inequality in health.

As for the effect of institutional variables included in the model, it can be concluded that capitalism, measured by the economic freedom index, and globalization affects inequality

in different directions. The positive and significant sign in the majority of cases for the variable globalization indicates that the greater the economic interdependence in the global market, the bigger inequality in health is. However, the negative and significant sign for the variable capitalism shows that the openness of developing countries, which allows a greater flow of capital and foreign investment, can improve child health inequality. Finally, democracy has no significant effect in these countries.

The crime rate has a negative effect on the inequality in health. Therefore, this result doesn't allow stating that in those countries where the homicide rate is greater, inequality is also more marked. Finally, life expectancy has a direct relationship with the inequality in health. This shows that there is a direct relationship of causality between the absolute health index and the relative one, in other words, an improvement of the overall health of the population does not imply that it is evenly distributed among the population.

The main objective of this study has been to analyze what the determinants of child health inequality in developing countries are. One of the issues that has given rise to more discussion among the researchers of such determinants of health and inequality in health is whether absolute income or relative income is more important. In accordance with the results of the estimates here, there is a direct relationship between the inequality in the distribution of income and inequality in health. For this reason, redistributive policies should be an essential element in any health equity plan. To achieve this, public intervention through health expenditure is necessary. However, the free market, private management, individualism, and ultimately capitalism in these countries can reduce child health inequalities. It is necessary to combine the advantages offered by the market with the virtues associated with intervention of the public sector, especially in such sensitive sectors as healthcare. Healthcare is a meritorious good, with strong positive externalities that should be taken into account when setting up a country's healthcare system. Reducing inequalities in health requires that the entire population has access to healthcare and the number of physicians has to be sufficient to guarantee a suitable health service.

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Ignacio Amate Fortes was Vice-Dean of the Economic and Business College at the University of Almería, Spain. Currently he is associate professor in the Department of Economics and Business of the University of Almería. His research fields are public economics, health, inequality, development and international economics. His most recent publication (with Almudena Guarnido Rueda, Agustin Molina Morales, and Agustin Molina Moralis) is “On the Perpetuation of the Situation of Economic and Social Underdevelopment in Africa”, in the *Journal of African American Studies*, 19 (3), 2015. In 2011, Almudena Guarnido Rueda and he received the VI Unicaja’s Prize in Economic Research.

Almudena Guarnido Rueda is associated professor in the Department of Economics and Business of the University of Almería, Spain. Her research fields are public economics, health, inequality, development and industrial organization.

Agustin Molina Morales is professor of public economics in the department of Economics and Business of the University of Almería, Spain. Currently, he leads the research group “Almería Group of Applied Economics”.