

# INEQUALITY OF OPPORTUNITY IN EARLY CHILDHOOD DEVELOPMENT IN ALGERIA OVER TIME

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## Abstract

Early childhood is the most important time for human development. However, countries tend to underinvest in this stage of development, particularly in the Middle East and North Africa. Children are facing unequal opportunities to develop because of the circumstances of their birth. This paper analyzes inequality of opportunity in early childhood development and trends over time in Algeria, using two surveys conducted between 2006 and 2012. The findings demonstrate that there is substantial inequality of opportunity starting early in life. A variety of circumstances impact early inequality, with wealth, mother's education, and geographic differences all contributing substantially.

**Keywords:** Early childhood development, inequality, Algeria.

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## **1. Introduction**

In an increasingly abundant literature, particular emphasis is placed on the inequalities of opportunities. According to this literature, inequalities in income, expenditure and wealth are generated, either because of differences in life circumstances or because of differences in the efforts made by individuals.

Similarly, the question is raised about the level of influence that personal circumstances have on children's access to the basic services necessary for productive life. Indeed, for some countries in Latin America in particular, it has been shown that much of the income inequality observed among adults is due to the circumstances they faced when they had just begun their lives, so in their early childhood. Roemer (1998) and Bourguignon et al. (2003 and 2007) have also shown that some of the inequalities in income or expenditure are directly explained by unequal opportunities.

To approach these inequalities in opportunities in several countries and at different levels, several empirical indices and approaches have been proposed. These include the Human Opportunity Index (HOI) proposed by Barros et al. (2008, 2009). Despite its limitations (Brunori et al., 2013), this index has often been used to approximate inequalities in children's access to basic services in conjunction with circumstances variables.

It appears from the literature that inequalities of this type for children are largely explained by the socio-economic characteristics of households. These inequalities are identified from the first six months of life in Egypt (Kirksey et al., 1994). Other inequalities, related to the poverty status of households and the different dimensions of child development (cognitive, physical, socio-emotional, etc.), were recorded by Grantham-McGregor et al. (2007) at the age of 10 months in India, 12 months in Brazil and 18 months in Bangladesh. Moreover, at the level of pre-school education, it has been demonstrated that any delay in cognitive or linguistic development could rapidly translate into an accumulation of delays that are difficult to catch up on later. Paxson and Schady (2007) reported in their study on Ecuador that differences in vocabulary, which may be low at age 3, are magnified at age 6, between children from households at different levels of income poverty or parental education. This may imply differences in terms of future integration into society.

These inequalities in terms of opportunities thus contribute to the perpetuation and even reinforcement of intergenerational poverty. The underlying cycle unfortunately is simple and obvious. Children in poor households accumulate little or no human capital, compared to those of the richest households. The same children of poor households are likely to be poor in adulthood.

On the other hand, some studies (Nores and Barnett (2010)), Sala-i-Martin, Doppelhofer, and Miller (2004) have shown that investment in early childhood would have a clear impact on economic growth through the accumulation of human capital. It also increases its performance, which would significantly exceed the costs that would be incurred in this area (Engle et al., 2011). Arbitration, in terms of economic policies, is then clear and obvious. Heckman and Masterov (2007) show that early childhood policies improve total equity in society.

However, one of the practical difficulties of this approach resides in the identification of the variables of circumstances to be taken into account versus those which represent the efforts of individuals. Indeed, at the empirical level each individual must be characterized by three types of variables. Those relating to income (wages, income, expenditure or other), those which represent other circumstances and those relating to the effort.

Bourguignon et al. (2003 and 2007) have also proposed an approach that assesses the contribution of inequalities in opportunities to unequal spending. This approach also identifies the exogenous determinants of income (or spending) that would be beyond the control of individuals (circumstances), other explanatory variables related to individual efforts. It makes it possible to approximate, by simulation, the fall in (monetary) inequality if the variables of circumstance had been the same between the individuals.

### **Literature in Arab countries**

Despite the importance of this issue, very few studies have dealt with it in the case of the MENA region. Krafft and El-Kogali (2014), Krafft (2015), Assaad (2013), Assaad, Krafft, Belhaj Hassine and Salehi-Isfahani (2012), Assaad Ragui., Hassine N.B., and Isfahani D.S. (2012). show that there is a substantial inequality of opportunity and that unequal opportunities are particularly high in early learning and in activities that promote early cognitive development. In the case of Algeria, two dimensions of inequality are generally dealt with: child labor (Musette (2004) and Boucherf (2014)) and schooling on the basis of a descriptive approach.

Krafft C (2015) examines the determinants and mediators of health disparities in children's height and weight in Jordan, focusing on factors that might mediate socio-economic disparities, including parental health knowledge, food quantity and quality, health conditions, the health environment, and prenatal development. She demonstrates that the health environment and food quantity and quality contribute to inequality in child health, these effects mediate only a small share of socio-economic disparities. A large share of inequality in children's health is determined prenatally, for instance through disparities in fetal growth.

Krafft C and El-Kogali S (2014) analyzes the inequality of opportunity in early childhood development in twelve countries in the Middle East and North Africa, assessing development along a variety of dimensions and across the early life course. They quantify inequality from in utero to age five in terms of health, nutrition, social-emotional development, early learning, and early work and decompose inequality into the shares related to different circumstances. The findings demonstrate that there is substantial inequality of opportunity starting early in life, and that inequality of opportunity is particularly high in early learning and in activities that support early cognitive development. A variety of circumstances impact early inequality, with wealth, mother's education, and geographic differences all contributing substantially. The analysis indicates that ensuring equality of opportunity in school and adult life will require redressing the causes of inequality of opportunity in early childhood.

Deficits accumulating across different developmental domains throughout early childhood compound each other (Helmers & Patnam, 2011) and position children for a lifetime of risk and diminished human capital.

Deficits in early childhood tend to persist into adult life. For instance, children who do not receive adequate iodine in the early years will have permanently decreased intelligence (Qian et al., 2005). Children who are stunted perform worse in school (Glewwe, Jacoby, & King, 2001) and ultimately earn lower wages (Hoddinott, Maluccio, Behrman, Flores, & Martorell, 2008). That early childhood is the most sensitive and important time for human development is now firmly established in the literature (Heckman, 2006, Shonkoff & Phillips, 2000).

The work proposed here would not only contribute to research on early childhood development and inequality in the MENA region, it would also provide information to identify vulnerable groups, major problems and factors limiting the development of children at the beginning of life. It will contribute to the analysis of inequalities during the early life cycle from birth to age five in Algeria.

The article would be structured around 5 sections. After the introduction, Section 1 will briefly outline the theoretical and conceptual framework of unequal opportunities in early childhood development. Section 2 will describe the data sources and methodology. Section 3 will present the descriptive results to motivate the analyzes. Section 4 presents the empirical results. Section 5 concludes this work.

## **2. Methodology and Analysis**

### **2.1. Data and Sample**

In this paper, we will exploit two surveys (Multiple Indicator Surveys MICS3 and MICS4) carried out in Algeria by the Ministry of Health, Population and Hospital Reform with the support of the United Nations Fund for (UNICEF), the United Nations Population Fund (UNFPA) and the National Office of Statistics (ONS). The MICS surveys provide information on the situation of children, women and households at the national level, according to socio-demographic and socio-economic characteristics of household members, in different domains related to health, education, protection, living conditions of the population.

The MICS3 survey targeted a sample of 29,400 households divided between the four health regions (Center, East, West and South). For information at a finer level, health regions were classified into 17 sub-regions. The MICS4 survey targeted a sample of 28,000 households distributed according to the seven territorial programming spaces. It thus provides statistics representative of the Algerian population at the national level and at the level of these territories.

Three questionnaires were used for these two surveys: 1) A "household" questionnaire for collecting information on housing conditions and demographic, social and health characteristics for all household members. 2) An individual questionnaire for each woman aged 15 to 49 years. 3) An individual

questionnaire for each child aged 0-5 years. The third questionnaire is particularly interesting to us in this work. It consists of six modules: (a) Birth registration and early childhood education. (b) Breastfeeding. (c) Treatment of diseases. (d) Vaccination. (e) Sanitary conditions for male circumcision. (f) Anthropometry.

## **2.2. Empirical Strategy**

In this article, we first propose to go beyond the traditional measures of the monetary inequalities usually calculated on household spending in Algeria. We will then approach the inequalities of early childhood opportunities. We will also examine the unequal opportunities that children in Algeria may encounter in early childhood in various areas of development: health, nutrition, socio-economic development, early learning and early work.

Our empirical strategy is three-fold. Initially, the state of early childhood development (ECD) will be assessed through at least twelve different indicators (prenatal consultations, birth attended by skilled personnel, infant mortality (under-one deaths), vaccination, underweight, stunting, wasting, iodized salt, early childhood care and education, parental development activities, violent discipline against children and child labor. Secondly, we will describe the relationship between these indicators and a number of characteristics of children's basic data (circumstances), such as gender, wealth, parents' education, place of residence (urban or rural) and region of residence.

Third, we will quantify the unequal chances that children face in order to live out their situation in each of these indicators, using the D-index dissimilarity index. This index quantifies inequality as the percentage of an outcome that should be redistributed from children in the best-off groups to children in the least well-off groups so that all children have equal opportunities for this outcome, irrespective of their circumstances. We will then decompose the inequality, measured by the D-index, according to the components due to the individual circumstances (such as gender), using Shapley decomposition.

Finally, we will compare the results for the "least favored" and "most advantaged" children. To compare the evolution over time of the situation of the "less favored" and the "most favored", we will simulate ECD results for the least favored child in relation to the most favored child. These simulations are based on regression analysis. The probability of a result (eg, access to care) is essentially predicted on the basis of the coefficients of a logit model estimate and the circumstances of the profile (least favored or most favored). This approach will allow us to identify the impact of the multiple circumstances simultaneously, as well as the gap between the most favored and the least favored child.

We will examine the development of early childhood in a variety of dimensions: health, nutrition, social and emotional development, early learning. Our indicators cover the entire early life cycle, from birth to the age of five, just before the age of entry into school, which is 6 years in Algeria.

### 2.3. Inequality of opportunity

To examine inequality in early childhood development, we draw on Roemer's (1998) conceptualization of inequality of opportunity. Roemer makes the distinction between circumstances and effort in determining an individual's outcomes. Effort is under an individual's control, and therefore inequality due to effort is morally acceptable. Circumstances are factors that lie outside an individual's control, and inequality due to circumstances is not morally justifiable, and constitutes inequality of opportunity.

In the case of early childhood development and the age range we are focusing on, from in utero to age five, no circumstances are within a child's control. Under Roemer's framework, all inequality in outcomes in early childhood is necessarily inequality of opportunity. The implication, that equality of opportunity in ECD can be achieved only by perfect equality in outcomes, is an unrealistic standard. Therefore, as others have done (Assaad, Krafft, Hassine, & Salehi-Isfahani, 2012), we modify the traditional approach and consider all inequality that is attributable to observable circumstances, such as gender, parents' education, wealth, and place of residence, to be inequality of opportunity. Inequality not explained by observable circumstances we attribute to 'luck' and do not consider it to be inequality of opportunity. Since a limited set of circumstances are observed in the surveys, our estimated inequality of opportunity is therefore a lower bound on true inequality of opportunity.

We measure inequality of opportunity using the dissimilarity index (D-index). The D-index for a particular ECD outcome is computed as:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^k \alpha_i |p_i - \bar{p}|$$

Where  $\bar{p}$  is the population mean for that outcome and  $p_i$  is the mean for unique circumstance group  $i$ . The  $\alpha_i$  are population shares or sampling weights (Barros et al. 2009). The D-index essentially compares the dissimilarity between groups, as defined by circumstances, and the population mean. The D-index can be interpreted as the percentage of available opportunities that need to be reallocated from the children in groups that are better off to the children in groups that are worse off in order to achieve equality of opportunity (de Barros et al., 2009). Expressed as a percentage, the D-index ranges from zero to 100, with zero indicating a situation of perfect equality of opportunity.

The D-index quantifies the inequality due to circumstances. This inequality can be decomposed into the shares due to different, specific circumstances, such as gender or wealth, using a Shapley decomposition (Deutsch & Silber, 2008, Shorrocks, 2013). The decomposition is based on the marginal contributions of each circumstance as they are removed from the regression in sequence.

Empirically, the D-index is computed based on a logistic regression model (Azevedo J.P., Franco S., Rubiano E., Hoyos A. (2010). Whether a child,  $j$ , has achieved a particular ECD outcome is regressed on his or her circumstances.

## **2.4. The explanatory variables**

We examine early childhood development across a variety of dimensions: health, nutrition, social and emotional development, and early learning and early work. Our indicators cover the entire early life course, from in utero through age five. For the age range we are examining, in utero through age five, any variations in early childhood development that are linked to the circumstances into which a child is born are considered inequality of opportunity. Children have no control over their circumstances at this age, such that circumstances can be treated as exogenous. For the sake of comparability across surveys and given the limitations of the datasets, we focus primarily on a relatively small set of circumstances that have previously been linked to ECD and inequality, namely child gender, household wealth, parents' education, rural/urban residence, and region of residence.

Wealth is operationalized as a categorical variable for which quintile of households a child falls into, based on an asset index (see Filmer & Pritchett, 2001, Rutstein & Johnson, 2004). Mother's and father's education were categorical variables for education levels. Rural/urban residence was a dichotomous variable. Regions were country specific categories.

## **3. Findings**

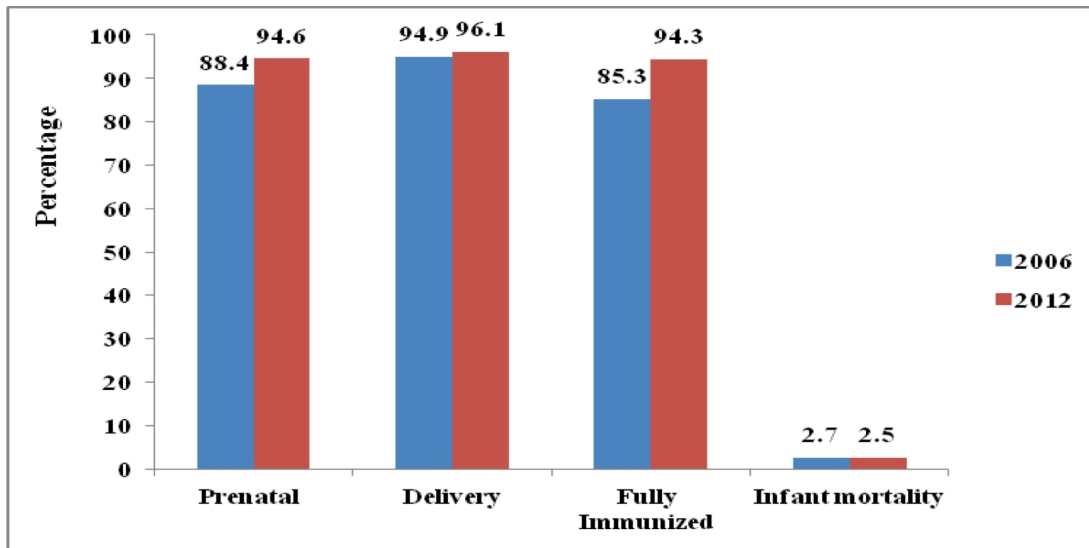
### **3.1. ECD Trends over Time**

We analyzed early childhood development trends in Algeria, looking first at health and survival, followed by nutrition, and then cognitive, emotional, and social development.

#### **3.1.1. Health and Survival**

While health and survival outcomes for the most part have been improving over time, major deficits remain. As shown in Figure 1, children's chances of prenatal care have increased from 88,4% in 2006 to 94,6% in 2012. The proportion is 83% for the case of Morocco (2012) and 98.1% for Tunisia (2012). A similar increase has occurred in delivery care from 94,9% in 2006 at 96,4% in 2012 (84% Morocco, 98.6% Tunisia - 2012). Algeria had good immunization coverage in 2006, with 85,3% of children aged one year fully immunized. This rate increased to 94,3% in 2012 (87% Morocco, 2011, 89.6%, 2012). Pushing this immunization rate higher is important to ensure herd immunity, that is, to achieve a level of immunization that is high enough to prevent widespread outbreaks. Owing at least in part to improved access to prenatal and delivery care, progress has been made in reducing infant mortality, it fell from 27 deaths per thousand births to 25 in 2012 (27 for Morocco, 2011, 17 for Tunisia, 2012).

**Figure 1.** Health and Survival Outcomes over Time

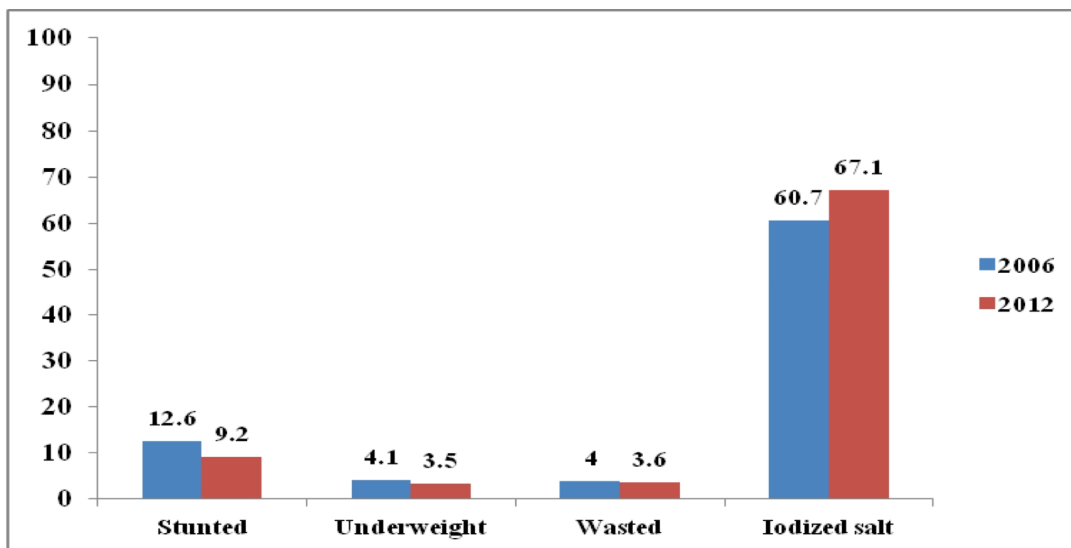


Source: Authors' calculations based on MICS2006 – 2012.

### 3.1.2. Nutrition

Children in Algeria face a number of ongoing challenges in terms of nutrition (Figure 2). There has been a decrease over time in the chances of stunting (which captures accumulated malnutrition). Almost 12.6% of the children were stunted as of 2006, and although the 2011 rate was lower 9.2% (15% in Morocco, 10.1% in Tunisia), many children's nutrition and development are threatened.

**Figure 2.** Nutrition outcomes over Time



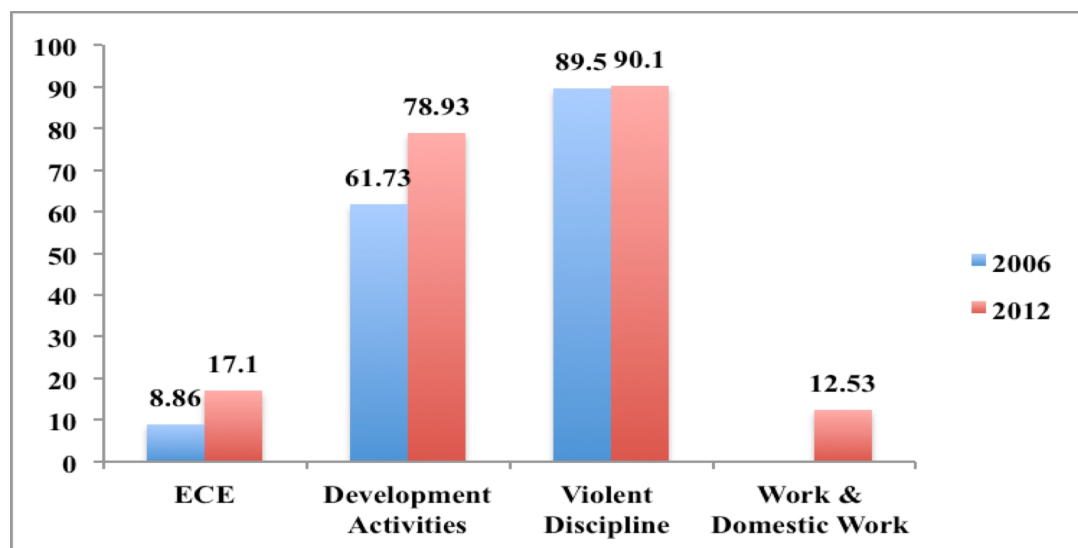
Source: Authors' calculations based on MICS2006 – 2012.



### 3.1.3. Cognitive, Emotional, and Social Development

Algerian children face a number of challenges in terms of their cognitive, emotional and social development. In 2006, approximately 9% of children aged five received early childhood education (ECE). By 2012, this rate had risen to 17.1%. The percentage of children engaged in developmental activities increased from 61.7% in 2006 to 78.9% in 2012 (34% for Morocco and 71.1% for Tunisia – 2012). Most concerning are the high chances of violent discipline, with 89.5% in 2006 and 90.1% in 2012 of children experiencing violent discipline in the past month, substantially endangering their development. This proportion is around 90% for Morocco (2006) and 94.9% for Tunisia (2012). Work or domestic work done by children aged 5 or under is also a potential problem, with 12.5% of children engaged in such work (20% for Morocco and 24% for Tunisia). This may make the transition to school more difficult.

**Figure 3.** Cognitive, Emotional, and Social Development Outcomes over Time



Source: Authors' calculations based on MICS2006 – 2012.

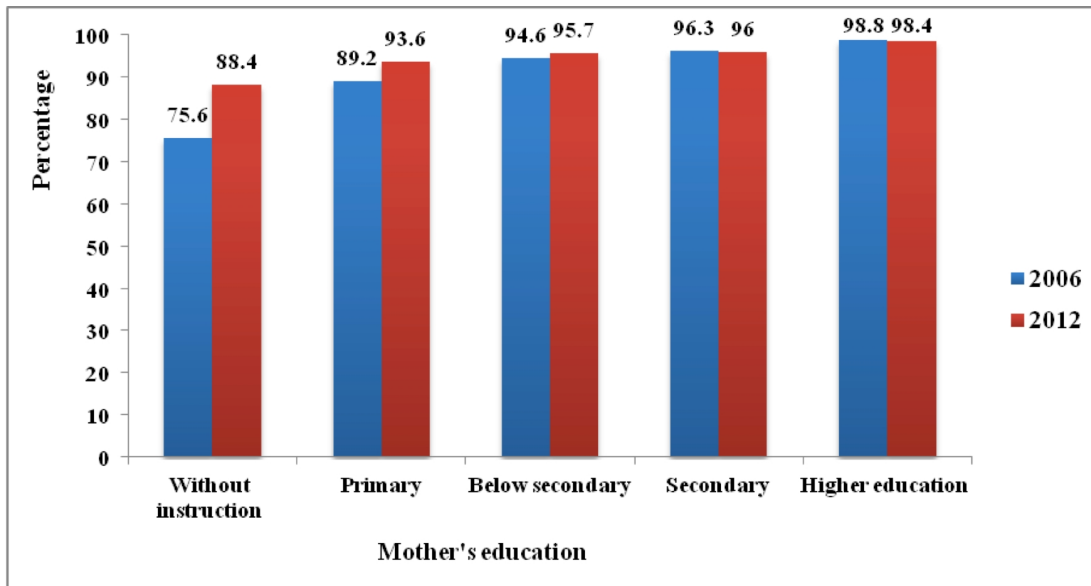
## 3.2. Risk Factors for Poor ECD over Time

### 3.2.1. Health and Survival

A number of different risk factors contribute to children's chances for poor ECD in health and nutrition. There has not been a systematic pattern in terms of rising or falling inequalities by children's different circumstances over time in health and survival. Inequality has been rising, falling, and remaining steady across different dimensions of health. Table 1 (in annex 1) shows health outcomes over time and their relationship with different circumstances.

With regard to prenatal and delivery care, there have been substantial disparities depending on the families' education and wealth and where the children live.

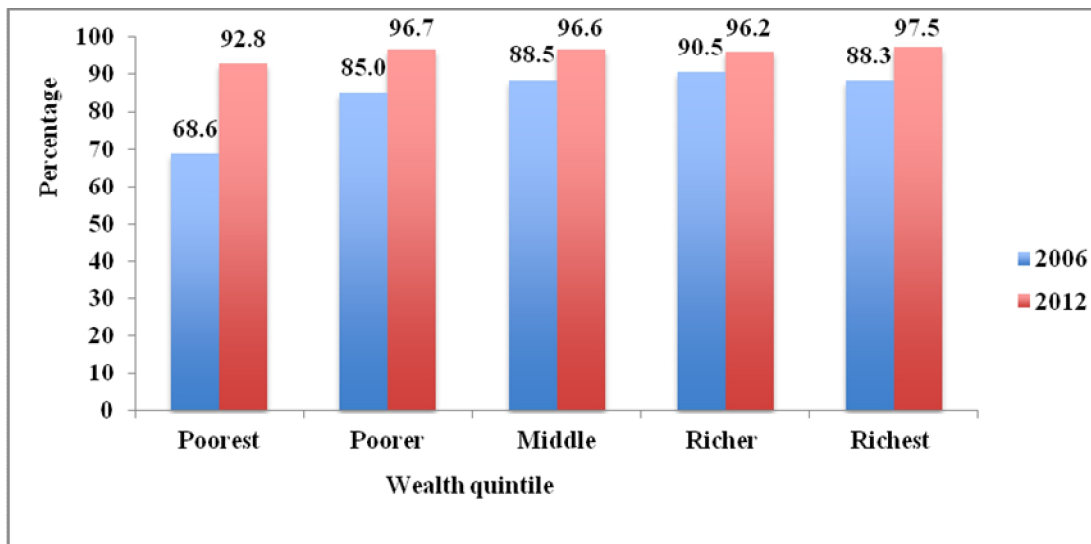
**Figure 4.** Prenatal Care by Mother's Education and Year (Percentage)



**Source:** Authors' calculations based on MICS2006 – 2012.

Disparities have, however, been narrowing over time as health care coverage has risen. Figure 4 shows narrowing disparities in prenatal care by mother's education over time. While children of uneducated mothers have the lowest chances of prenatal care and children of secondary and higher educated mothers have always had chances in the 95–100 percent range, these gaps have been narrowing. While in 2006, 75,6% of births to uneducated mothers had prenatal care, this rose to 88,4% by 2012.

**Figure 5.** Fully Immunized by Wealth Quintile and Year



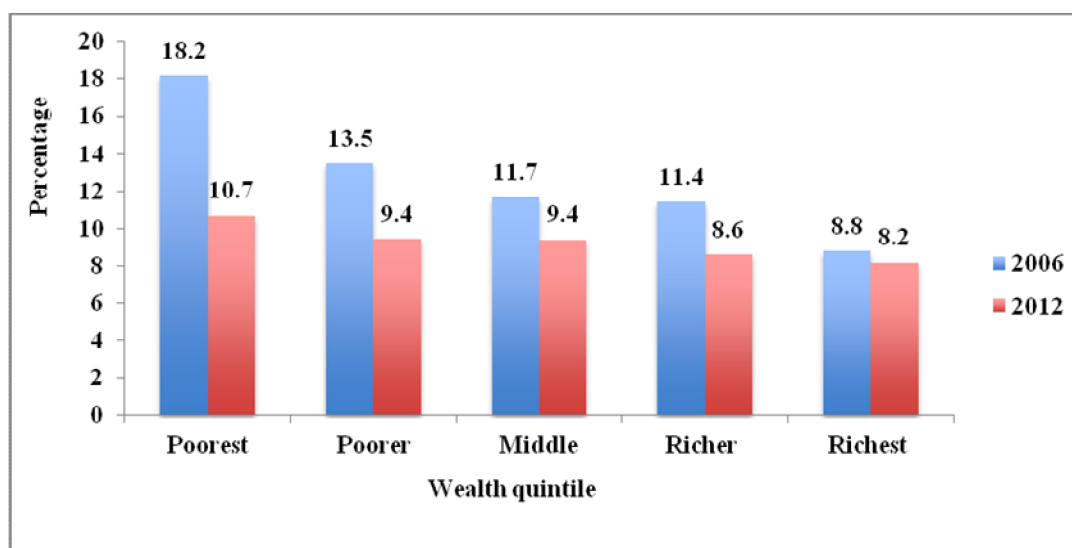
**Source:** Authors' calculations based on MICS2006 – 2012.

The poorest children have always had the lowest chances of being fully immunized (Figure 5), the chance of children from the poorest fifth of households being fully immunized is around 68.6% in 2006 (92.8% in 2012). On the other hand, the chance of children from the richest fifth of households being fully immunized was more than 97% in 2012. There are also regional differences, the lowest proportion in fully immunization is recorded in Higher Plateau Central (88.6%) and in South region (92.8%). Other results are a positive correlation between full immunization and the education of the mother. The education of the mother is very important for the children car.

### 3.2.2. Nutrition

In addition to facing different chances of early health care and even early death, children face unequal chances of healthy growth and nutrition depending on their backgrounds. Table 2, in the annex, presents the full set of relationships between nutrition and children’s background. Notably, there are substantial disparities in nutrition by wealth (Figure 6). As of 2012, 10.7% of the poorest children were stunted compared to 8.2% of the richest. In addition to differences by wealth, there are substantial disparities depending on where children live and the mother’s education for stunting and other nutrition outcomes.

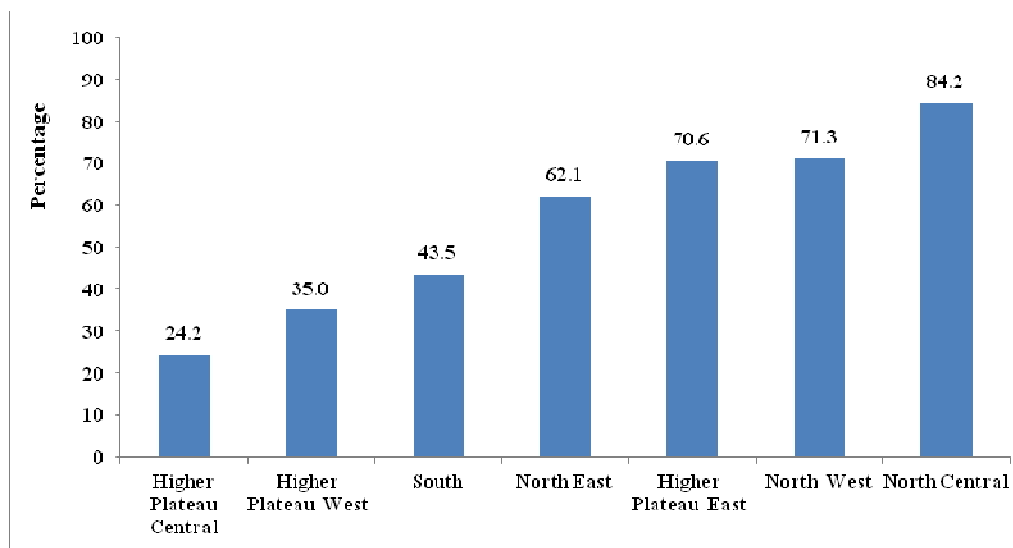
**Figure 6.** Stunting by Wealth Quintile and Year



**Source:** Authors’ calculations based on MICS2006 – 2012.

Location acutely affects children’s chances of living in a household that uses adequately iodized salt and, therefore, being protected against cognitive deficits. As Figure 7 shows, rates range from 24.2% in Higher Plateau Central to 84.2% in North Central. Additionally, there are large differences by wealth and parents’ education (mother’s education).

**Figure 7.** Adequately iodized Salt by Region

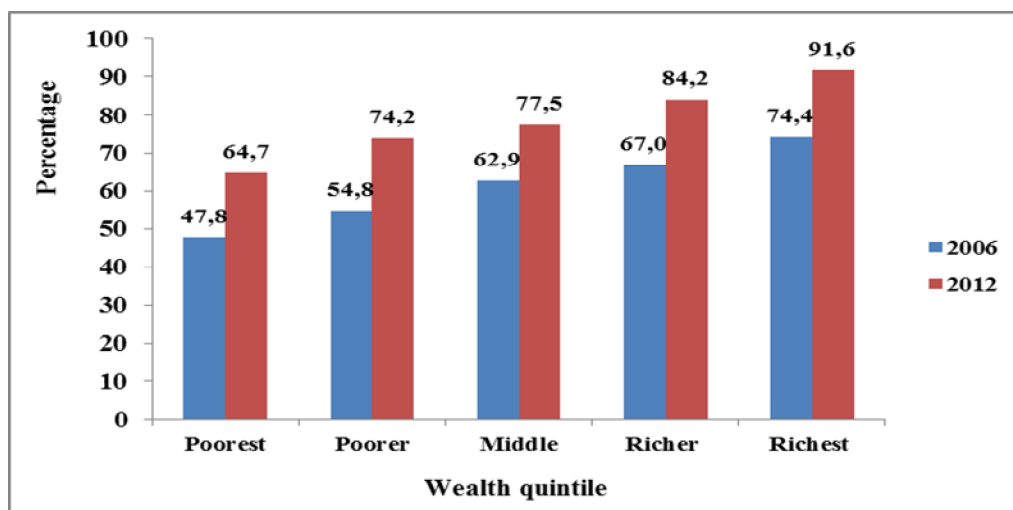


**Source:** Authors' calculations based on MICS2006 – 2012.

### 3.2.3. Cognitive, social and Emotional Development

Children's social, emotional and cognitive development shows substantial disparities depending on their circumstances (annex, Table 3). These differences will lead to persistent disparities in adult life (school and in the labor market). Children's chances of experiencing development activities are closely linked to their backgrounds and poverty is increasingly a risk factor for poor development (figure 8). While in 2006 around 47.8% of the poorest children and 74.4% for the richest children experienced development activities, this increased to 64.7% in 2012 for the poorest and 91.6% for the richest in 2012. Differences by region and parent's education also occur.

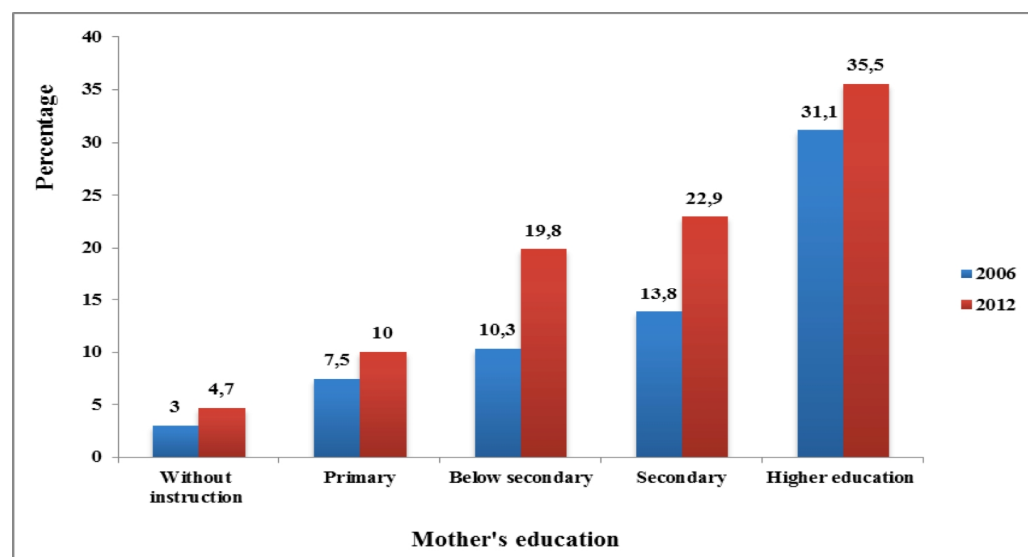
**Figure 8.** Development Activities by Wealth and Year



**Source:** Authors' calculations based on MICS2006 – 2012.

Figure 9 shows differences in ECE attendance by mother's education over time, we find a positive correlation between education of the mother and ECE where the proportion increased for all groups (whatever the level of education of the mother) over time. For the first group (no education of mother) the proportion is around 3% in 2006 (4.7% in 2012), while the proportion is around 31% in 2006 (35.5% in 2012) when the education of mother is higher. Differences in ECE are visible depending in region of residence and wealth.

**Figure 9.** ECE Attendance at Age 5 by Mother's Education



Source: Authors' calculations based on MICS2006 – 2012.

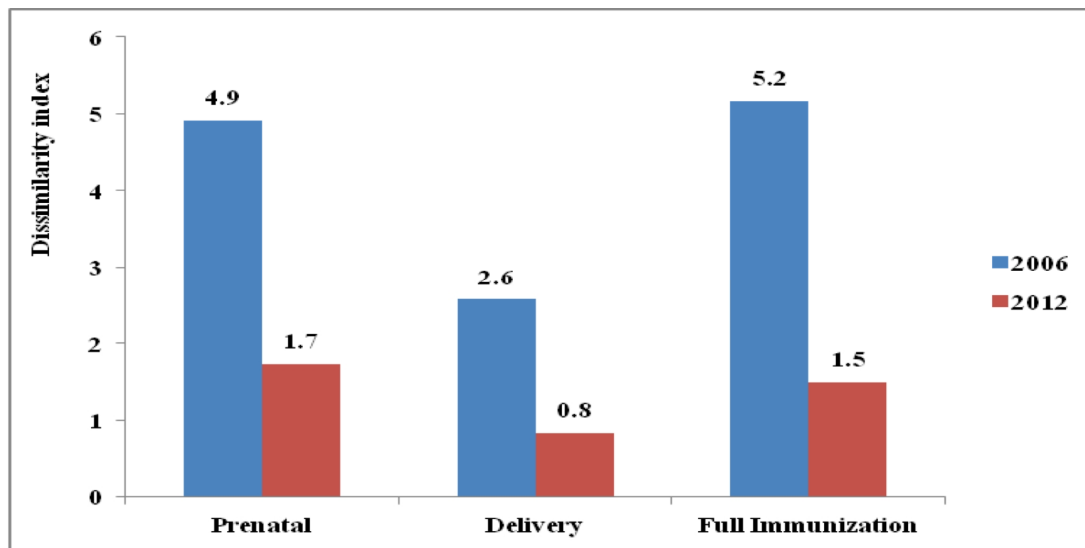
#### 4. Inequality in ECD over Time

Inequality in early childhood is of particular concern for three reasons. First, it is morally objectionable, Children have no control over their circumstances. Second, it acts as a key mechanism for adult inequality because disparities tend to persist and are even compounded. Third, inequality in early childhood plays an important role in the intergenerational transmission of poverty. This section assesses how inequality has been evolving over time in Algeria. The tables underlying the quantification of inequality (dissimilarity index) and the different factors that contribute to inequality (Shapley decomposition) are presented in the annex (Table 4 and Table 5).

##### 4.1. Health and Survival

Young children in Algeria face widely disparate development opportunities in terms of health. Inequality persists in access to early health care. Around 2 and 1 percent of the opportunities for prenatal, full immunization and delivery care would have to have been distributed differently for equality of opportunity to prevail in 2012. However, these levels are substantially lower (by more than 30 percent) compared to 2006.

**Figure 10.** Inequality (Dissimilarity Index) in Health and Survival by Year

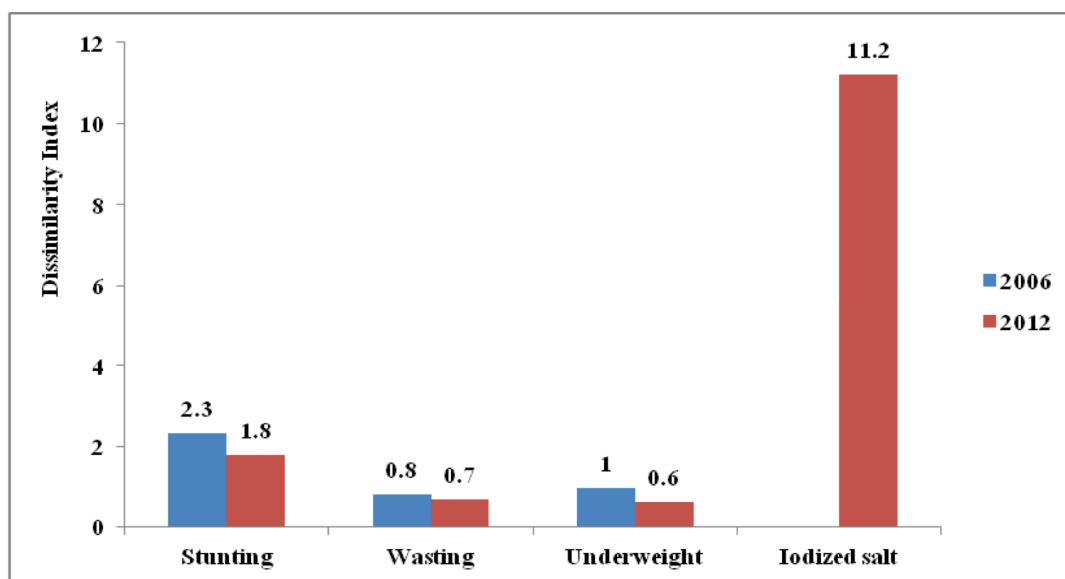


Source: Authors' calculations based on MICS2006 – 2012.

#### 4.2. Nutrition

Inequality in nutrition in terms of being stunted, underweight, and wasted is low and has decreased between 2006 and 2012 (0.5% for stunting, 0.1% for wasting and 0.4% for underweight).

**Figure 11.** Inequality (Dissimilarity Index) in Nutrition by Year



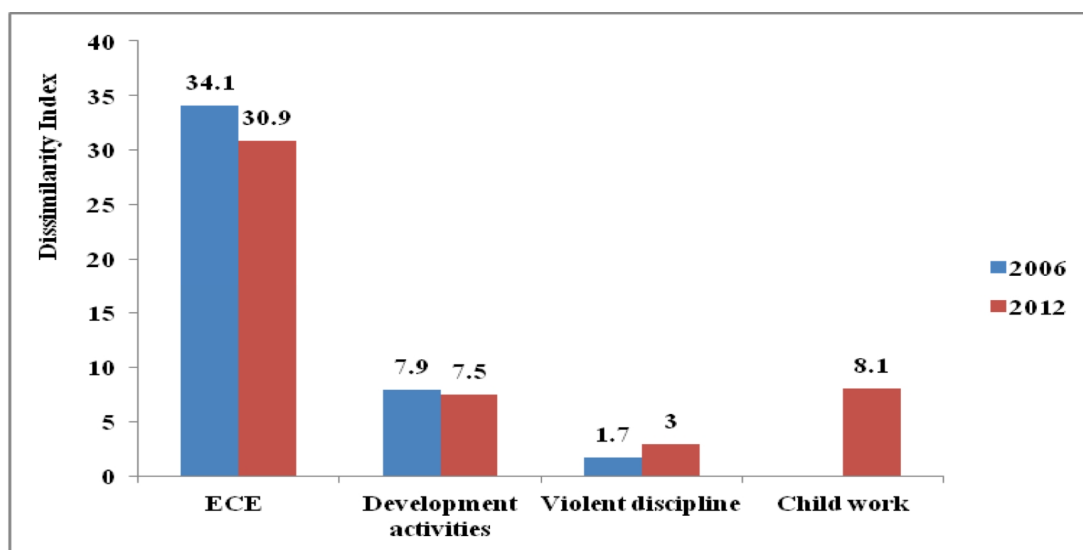
Source: Authors' calculations based on MICS2006 – 2012.

The level of inequality in access to adequately iodized salt is very high<sup>3</sup>. For children to have equal chances, 20 percent of the opportunities to access adequately iodized salt would have to be redistributed. Urban/rural differences contribute substantially to inequality, along with regional differences.

### 4.3. Cognitive, Social, and Emotional Development

Children’s social, emotional, and cognitive development shows some of the greatest and most persistent inequalities. As of 2006, the inequality was 34,1% of opportunities needing to be redistributed for ECE, 7.9% for development activities, 1.7% for violent child discipline. By 2012, inequality decreases for ECE (30.9%) also for development activities (7,5%). However, inequality for violent discipline increases 3%. No data are available for comparing violent discipline or work (including domestic work) over time.

**Figure 12.** Inequality (Dissimilarity Index) in Social, Emotional, and Cognitive Development by Year



**Source:** Authors’ calculations based on MICS2006 – 2012.

<sup>3</sup> Only one year of data is available (so we are unable to assess trends).

## 5. Circumstances Contributing to Inequality in ECD

The Shapley decompositions show the relative contributions of different circumstances (wealth, mother's education, region, urban versus rural and gender) to the inequality, as percentages. The contributions of different background characteristics vary over time and across the measures of ECD. Firstly, wealth contributes substantially. Mother's education also plays an important role in inequality. Regional and urban/rural differences contribute to inequality, often substantially, but to varying degrees across indicators. Notably, the child's gender contributes very little to inequality of opportunity in ECD except for child work. In 2012, 29-18% of the inequality in prenatal and delivery care was due to wealth and 38-31% due to mother's education. Wealth plays an increasing role in ECE (30.5% in 2012) and development activities (29.6% in 2012). Urban-rural disparities are particularly large contributors to inequality in ECE (30.6% in 2012) and development activities (16.9% in 2012). Regional disparities make particularly large contributions to inequality in work, including domestic work (55%) at age five. These different contributing factors can help policymakers target groups particularly at risk for disparities and understand some of the mechanisms contributing to inequality in ECD.

**Table 1.** Shapley decomposition of the D-Index (Percentage explained by each variable)

		Child Gender	Mother's Education	Rural	Region	Wealth
<b>ECE</b>	<b>2006</b>	2.4	35.9	17.6	8.3	35.8
	<b>2012</b>	0.2	36.2	30.6	2.4	30.5
<b>NonStunting</b>	<b>2006</b>	3.5	29.1	10.4	19.6	37.4
	<b>2012</b>	12.3	41.9	11.9	5.6	28.2
<b>NonWasting</b>	<b>2006</b>	6.7	7.3	15.2	69.2	1.7
	<b>2012</b>	11.8	4.2	8.7	72	3.4
<b>NonUnderweight</b>	<b>2006</b>	0.8	22	12	38.9	26.2
	<b>2012</b>	0.2	20.3	5.3	51	23.3
<b>Development activities</b>	<b>2006</b>	0.5	23.1	17.2	25.2	34.1
	<b>2012</b>	0.1	31.7	16.9	21.7	29.6
<b>Fully Immunized</b>	<b>2006</b>	3.8	32.5	11.1	26.6	26
	<b>2012</b>	2.2	36.7	13	16.3	31.8
<b>Prenatal</b>	<b>2006</b>	na	38.7	20.4	8.9	32.1
	<b>2012</b>	na	35.8	15.6	18.8	29.8
<b>Delivery</b>	<b>2006</b>	na	31.7	24.1	15.8	28.4
	<b>2012</b>	na	18.1	22	41.3	18.7
<b>Iodized salt</b>	<b>2006</b>	-	-	-	-	-
	<b>2012</b>	0	9.2	7.4	60.9	22.6
<b>Work and Domestic</b>	<b>2006</b>	-	-	-	-	-
	<b>2012</b>	34.7	6.6	0.5	55	3.1
<b>Violent discipline</b>	<b>2006</b>	0	26	33.3	14	26.7
	<b>2012</b>	0	92.4	0.4	3.8	3.4

**Source:** Authors' calculations based on MICS 2006-2012. Note: n.a. = Not applicable.



## **6. Conclusion**

The early years of life are crucial for human development. Deficits and inequality early in life tend to accumulate and lead to persistent shortfalls in human capital. This paper has examined Early Childhood Development Algeria across multiple dimensions of development and over time. Examining eleven different indicators, covering a variety of dimensions of development and the early life course from in utero through age five, we measured inequality of opportunity in early childhood development. The deficits and inequalities we observe in Early Childhood Development are troubling from the issues of equity because children are being affected by circumstances entirely outside of their control. Children face unequal opportunities to develop in terms of health, nutrition, cognitive, social, and emotional development. These deficits and inequalities are also limiting the human and economic potential of the country. Our analysis also illustrated the contributions of circumstances to children's early opportunities. Wealth, mother's education, and geographic differences tend to contribute substantially to inequality of opportunity. The practical approach and measurement of inequalities of all kinds are therefore crucial in order to better guide policies in terms of development and improvement of equity and equal opportunity indices in particular.

## ANNEX

**Table 1.** Health and Survival Outcomes over Time

<b>Indicators</b>	<b>Definition</b>
<b>Prenatal care</b>	Measured as prenatal care from a doctor, nurse, or midwife.
<b>Trained attendant at delivery</b>	Measured as a delivery attended by a doctor, nurse, or midwife
<b>Infant mortality</b>	Dying in the first year
<b>Fully immunized</b>	Measured for children aged 12–23 months in terms of whether they had received the BCG (tuberculosis), measles, 3 DPT (Diphtheria, Pertussis [Whooping cough], and Tetanus) vaccine doses, and 3 polio vaccine doses
<b>Stunting</b>	Children are considered stunted when they are two standard deviations below the WHO healthy reference population in terms of height-for-age
<b>Underweight</b>	Children are considered underweight when they are two standard deviations below the WHO healthy reference population in terms of weight-for-age
<b>Wasting</b>	Children are considered wasted when they are two standard deviations below the WHO healthy reference population in terms of weight-for-height what is wasted and is it the same as stunted and underweight
<b>Iodized salt</b>	Salt with at least 15 ppm of iodine
<b>Early childhood education</b>	Early childhood refers to the period between birth and 8 years of life. The widely used term ‘early childhood education’ (ECE) refers to a range of processes and mechanisms that sustain and support development during the early years of life: it encompasses education, physical, social and emotional care, intellectual stimulation.
<b>Parental development activities</b>	The six activities are (a) reading books or look at picture books with the child; (b) telling stories to the child; (c) singing songs with the child; (d) taking the child outside the home, compound, yard, or enclosure; (e) playing with the child; and (f) spending time with the child naming, counting, and/or drawing things
<b>Violent child discipline</b>	According to the MICS definitions, violent child discipline is based on discipline by anyone in the household within the last month and includes psychological aggression (shouted, yelled, or screamed at the child; called the child dumb, lazy, or another name like that); physical punishment (shook the child; spanked, hit, or slapped the child on the bottom with a bare hand; hit the child on the bottom or elsewhere on the body with something like a belt, hairbrush, stick, or other hard object; hit or slapped the child on the hand, arm, or leg); and severe physical punishment (hit or slapped the child on the face, head, or ears; beat the child with an implement; hit over and over as hard as one could)
<b>Work and domestic work</b>	The questions to capture work were as follows: (a) During the past week, did (the child) do any kind of work for someone who is not a member of this household? (b) During the past week, did (the child) help with household chores such as shopping, collecting firewood, cleaning, fetching water, or caring for children? (c) During the past week did (the child) do any other family work (on the farm or in a business or selling goods in the street)?

## ANNEX

**Table 2.** Characteristics and Health and Survival (Percentages)

	Prenatal		Delivery		Infant mortality		Fully immunized	
	2006	2012	2006	2012	2006	2012	2006	2012
<b>Wealth Quintile</b>								
Poorest	74.1	89.8	85.3	95.4	-	31.3	68.6	92.8
Poorer	86.6	94.6	95.8	95.4	-	17.7	85	96.7
Middle	91.8	94.9	97.2	97.4	-	18.2	88.5	96.6
Richer	93.6	97.2	98.4	96.5	-	20.3	90.5	96.2
Richest	97.3	97.6	98.4	96.9	-	17.5	88.3	97.5
<b>Region</b>								
North Central	93.3	97.4	95	96.6	-	14	90.8	98.4
North East	87.7	97	96.6	98,3	-	16.7	92.9	98
North West	88.3	90.4	97.3	96,7	-	27.6	79.3	90.2
Higher Plateau Central	78.5	93	88.4	97,5	-	26.2	49.5	88.6
Higher Plateau East	86.9	96.5	96.8	95,9	-	25.5	77.3	97.4
Higher Plateau West	79.3	90.1	94.2	97,2	-	19.9	79.7	93.9
South	88.1	89	90.4	90,5	-	32.1	81.1	92.8
<b>Mother's education</b>								
None	75.6	88.4	87.6	94,9	-	25.6	70.7	92.5
Primary	89.2	93.6	96.7	96,1	-	22.8	88	96.5
Below secondary	94.6	95.7	98.2	96,1	-	20	89.1	96.7
Secondary	96.3	96	98.7	96,5	-	19.3	91.4	97.4
Higher education	98.8	98.4	98.9	97,4	-	-	88	96.2
<b>Total</b>	<b>88.4</b>	<b>94.6</b>	<b>94.9</b>	<b>96.1</b>	<b>27.2</b>	<b>25.1</b>	<b>85.3</b>	<b>94.3</b>

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 3.** Characteristics and Nutrition (Percentages)

	Stunted		Underweight		Wasted		Iodized Salt	
	2006	2012	2006	2012	2006	2012	2006	2012
<b>Wealth Quintile</b>								
Poorest	18.2	10.7	5.8	4.4	3.9	3.9	40.3	53.9
Poorer	13.5	9.4	5.1	3.4	4.1	3.2	52.7	62.4
Middle	11.7	9.4	4.4	3.9	4.3	3.5	60.5	65.7
Richer	11.4	8.6	2.9	3	2.9	3.8	67.2	70.7
Richest	8.8	8.2	2.5	2.8	4.8	3.6	81.3	81.8
<b>Region</b>								
North Central	9.3	5.1	2.7	1.9	2.7	2	-	84.2
North East	14.4	10.8	4.1	4	4	5.7	-	62.1
North West	11.7	16	3.5	3.4	6	3.6	-	71.3
Higher Plateau Central	19.9	12.2	7.8	4.1	6.6	4.4	-	24.2
Higher Plateau East	9.7	8.6	2.7	4	2.4	3.2	-	70.6
Higher Plateau West	18.8	13	4.8	4.7	3.4	4.2	-	35
South	17.6	9.4	8.9	6	6.7	6.2	-	43.5
<b>Mother's education</b>								
None	16.7	11	5.5	4.4	3.5	3.9	-	57.8
Primary	11.9	10.1	4.5	3.7	4.4	3.5	-	68.1
Below secondary	10.9	8.8	3.7	3.5	4	3.9	-	71.4
Secondary	10.6	8.2	3.0	3	4	3.5	-	78.8
Secondary – Higher education (2012)								
Higher education	6.5	8.2	1.5	2.5	5.1	2.9	-	-
<b>Total</b>	<b>12.6</b>	<b>9.2</b>	<b>4.1</b>	<b>3.5</b>	<b>4</b>	<b>3.6</b>	<b>38.9</b>	<b>67.1</b>

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 4.** Characteristics and Social, Emotional and Cognitive Development (Percentages)

	ECE		Development activities		Violent discipline		Work and Domestic Work	
	2006	2012	2006	2012	2006	2012	2006	2012
<b>Wealth Quintile</b>								
Poorest	2.8	6.6	47.8	64.7	86.9	89.2	-	10.1
Poorer	3.7	11.8	54.8	74.2	89.8	90.7	-	15.6
Middle	6.4	15.4	62.9	77.5	90.2	90.8	-	13.7
Richer	10.8	19.8	67	84.2	90.3	91.2	-	12.8
Richest	19.7	29.8	74.4	91.6	90.2	88.6	-	9.6
<b>Region</b>								
North Central	8.1	16.9	69.9	86.1	85.3	92.1	-	15.7
North East	8.5	24	67.6	91.5	90.5	86.5	-	8.8
North West	9.9	16.6	55.7	84.3	92.2	86.2	-	9.7
Higher Plateau Central	3.9	5.4	52	61.9	88.3	90.1	-	4.3
Higher Plateau East	7.9	13.5	57.3	68	93.2	90.3	-	10.3
Higher Plateau West	9.2	8.1	53.1	67.4	91.4	89.2	-	14.4
South	14.6	28.1	54.2	69.9	92	94.2	-	19.3
<b>Mother's education</b>								
None	3	4.7	52.6	60.3	89.2	85.3	-	9.6
Primary	7.5	10	60.3	74.4	90.9	89.6	-	10.7
Below secondary	10.3	19.8	64.1	84.7	90.1	90.9	-	12.8
Secondary <sup>4</sup>	13.8	22.9	69.8	86.9	88.6	83.2	-	16
Higher education	31.1	35.5	76.5	88.4	81.1		-	13.8
<b>Total</b>	<b>8.9</b>	<b>17.1</b>	<b>61.7</b>	<b>78.9</b>	<b>89.5</b>	<b>90.1</b>	<b>-</b>	<b>12.5</b>

**Source:** Authors' calculations based on MICS 2006-2012.

<sup>4</sup> Secondary – Higher education (2012).

## ANNEX

**Table 5.** Determinants of Risk Factors for Poor ECD over Time - Logistic regression (marginal effects)

	NonStunting		NonWasting		NonUnderweight	
	2006	2012	2006	2012	2006	2012
<b>Gender (Ref. Female)</b>						
Male	-0.0120** (0.00576)	-0.0116** (0.00509)	-0.00293 (0.00340)	-0.00435 (0.00321)	-0.00132 (0.00331)	-0.000114 (0.00317)
<b>Residence (Refd. Rural)</b>						
Urban	-0.0142** (0.00707)	-0.00322 (0.00638)	-0.00363 (0.00420)	-0.00289 (0.00402)	0.00242 (0.00404)	-0.00341 (0.00385)
<b>Region (ref. North Central)</b>						
North East	-0.0758*** (0.0139)	-0.0737*** (0.0185)	-0.0237*** (0.00911)	-0.0695*** (0.0173)	-0.0285*** (0.00988)	-0.0342** (0.0136)
North West	-0.0179 (0.0116)	-0.166*** (0.0213)	-0.0402*** (0.00944)	-0.0233** (0.0117)	-0.0159* (0.00844)	-0.0211* (0.0114)
Higher Plateau Central	-0.0879*** (0.0136)	-0.0942*** (0.0172)	-0.0453*** (0.0103)	-0.0363*** (0.0122)	-0.0604*** (0.0114)	-0.0318*** (0.0116)
Higher Plateau East	0.00983 (0.0124)	-0.0565*** (0.0162)	0.00671 (0.00771)	-0.0133 (0.0103)	0.00156 (0.00842)	-0.0312*** (0.0121)
Higher Plateau West	-0.0930*** (0.0190)	-0.0992*** (0.0173)	-0.00743 (0.0109)	-0.0373*** (0.0122)	-0.0247* (0.0129)	-0.0402*** (0.0124)
South	-0.0846*** (0.0121)	-0.0518*** (0.0148)	-0.0441*** (0.00885)	-0.0664*** (0.0143)	-0.0775*** (0.0109)	-0.0617*** (0.0138)
<b>Mother's Education (ref. Without instruction)</b>						
Primary	0.0294*** (0.00725)	0.0115 (0.00731)	-0.00271 (0.00518)	0.00731 (0.00479)	0.00228 (0.00431)	0.00630 (0.00437)
Below secondary	0.0364*** (0.00748)	0.0234*** (0.00688)	-0.00368 (0.00533)	-0.00367 (0.00490)	0.00953** (0.00442)	0.00707* (0.00424)
Secondary	0.0307*** (0.00828)	0.0200*** (0.00748)	-0.00500 (0.00589)	0.00359 (0.00505)	0.0125*** (0.00481)	0.00871* (0.00451)
Higher education	0.0607*** (0.0123)	0.0199** (0.00979)	-0.0160 (0.0113)	0.0107* (0.00593)	0.0213*** (0.00737)	0.0150*** (0.00542)
<b>Wealth (ref Poorest)</b>						
Poorer	0.0349*** (0.00748)	0.0120 (0.00744)	-0.00281 (0.00578)	0.00302 (0.00501)	0.00447 (0.00448)	0.00790* (0.00432)
Middle	0.0461*** (0.00785)	0.0193** (0.00795)	-0.00378 (0.00620)	0.00186 (0.00551)	0.00772 (0.00478)	0.00587 (0.00480)
Richer	0.0598*** (0.00817)	0.0223*** (0.00811)	0.0115** (0.00573)	0.00155 (0.00565)	0.0225*** (0.00460)	0.0109** (0.00473)
Richest	0.0765*** (0.00844)	0.0242*** (0.00858)	-0.00421 (0.00720)	0.00152 (0.00606)	0.0223*** (0.00511)	0.0159*** (0.00487)
<b>Observations</b>	<b>13712</b>	<b>13751</b>	<b>13618</b>	<b>13681</b>	<b>13781</b>	<b>13813</b>

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

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 5 (continued).** Determinants of Risk Factors for Poor ECD over Time - Logistic regression  
(marginal effects)

	ECE		Development activities		Violent discipline		Child work	
	2006	2012	2006	2012	2006	2012	2006	2012
<b>Gender (Ref. Female)</b>	-0.00867	0.00521	0.00373	0.00342	0.00648	0.0159		0.00772
Male	(0.00628)	(0.00752)	(0.00851)	(0.0116)	(0.00922)	(0.0103)		(0.0104)
<b>Residence (Refd. Rural)</b>	-0.0104	-0.0679**	-0.0175*	-0.0413***	-0.00147	0.0159**		0.0227*
Urban	(0.00813)	(0.00942)	(0.0106)	(0.0146)	(0.00525)	(0.00622)		(0.0125)
<b>Region (ref. North Central)</b>								
North East	-0.00460	-0.0510***	-0.0212	-0.0703***	0.0277***	-0.0501***		-0.0507***
	(0.0118)	(0.0184)	(0.0158)	(0.0262)	(0.00558)	(0.0121)		(0.0143)
North West	-0.0116	0.000485	0.131***	0.0236	0.0462***	-0.0537***		-0.0535***
	(0.0114)	(0.0146)	(0.0148)	(0.0293)	(0.00498)	(0.0118)		(0.0140)
Higher Plateau Central	0.0342***	0.0706***	0.166***	0.233***	0.0103*	-0.0205**		-0.0890***
	(0.00957)	(0.0103)	(0.0148)	(0.0312)	(0.00609)	(0.0102)		(0.0117)
Higher Plateau East	0.00695	0.0202	0.103***	0.211***	0.0482***	-0.0160		-0.0309**
	(0.0118)	(0.0127)	(0.0171)	(0.0322)	(0.00550)	(0.0103)		(0.0156)
Higher Plateau West	-0.00343	0.0548***	0.149***	0.214***	0.0306***	-0.0269***		-0.00593
	(0.0154)	(0.0109)	(0.0204)	(0.0319)	(0.00736)	(0.0104)		(0.0176)
South	-0.0727***	-0.101***	0.179***	0.197***	0.0443***	0.0316***		0.0294
	(0.0144)	(0.0193)	(0.0137)	(0.0304)	(0.00507)	(0.00822)		(0.0197)
<b>Mother's Education (ref. Without instruction)</b>								
Primary	-0.0467***	-0.0599***	-0.0377***	-0.0609***	0.0120**	0.0170***		-0.00566
	(0.0149)	(0.0211)	(0.0121)	(0.0143)	(0.00529)	(0.00589)		(0.0163)
Below secondary	-0.0589***	-0.1000***	-0.0463***	-0.0938***	0.0160***	0.0327***		0.0204
	(0.0154)	(0.0197)	(0.0122)	(0.0141)	(0.00527)	(0.00559)		(0.0166)
Secondary	-0.0791***	-0.130***	-0.0742***	-0.138***	-0.00936	0.0152*		0.0290
	(0.0180)	(0.0232)	(0.0131)	(0.0139)	(0.0104)	(0.00901)		(0.0191)
Higher education	-0.206***	-0.239***	-0.0945***	-0.115***				0.0169
	(0.0419)	(0.0381)	(0.0218)	(0.0193)				(0.0281)
<b>Wealth (ref Poorest)</b>								
Poorer	-0.0118	-0.0682***	-0.0599***	-0.0394**	0.00850	0.00128		0.0376*
	(0.0154)	(0.0234)	(0.0130)	(0.0158)	(0.00640)	(0.00719)		(0.0201)
Middle	-0.0158	-0.0869***	-0.124***	-0.0725***	0.0104	0.00687		0.0286
	(0.0159)	(0.0254)	(0.0133)	(0.0161)	(0.00676)	(0.00789)		(0.0212)
Richer	-0.0508***	-0.101***	-0.148***	-0.103***	0.00418	-0.00625		0.0122
	(0.0194)	(0.0258)	(0.0140)	(0.0161)	(0.00741)	(0.00850)		(0.0211)
Richest	-0.0988***	-0.153***	-0.198***	-0.164***	0.00167	-0.0227**		-0.0219
	(0.0253)	(0.0290)	(0.0144)	(0.0158)	(0.00815)	(0.00961)		(0.0193)
<b>Observations</b>	<b>5346</b>	<b>5517</b>	<b>14227</b>	<b>5395</b>	<b>18993</b>	<b>16668</b>		<b>3030</b>

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

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 5 (continued).** Determinants of Risk Factors for Poor ECD over Time- Logistic regression (marginal effects)

	NonImmunized		NonDelivery		NonPrenatal	
	2006	2012	2006	2012	2006	2012
<b>Gender (Ref. Female)</b>	-0.0240	-0.00362				
Male	(0.0184)	(0.00405)				
<b>Residence (Ref. Rural)</b>	0.0392	-0.00122	-0.0247***	-0.0149***	-0.0241***	-0.00197
Urban	(0.0240)	(0.00506)	(0.00394)	(0.00574)	(0.00621)	(0.00495)
<b>Region (ref. North Central)</b>						
North East	-0.0601*	0.0102	-0.00189	-0.0163**	0.0696***	0.0248
	(0.0310)	(0.0160)	(0.00542)	(0.00697)	(0.0151)	(0.0195)
North West	0.137***	0.176***	-0.0117***	-0.0117	0.0762***	0.0828***
	(0.0455)	(0.0398)	(0.00447)	(0.00722)	(0.0143)	(0.0282)
Higher Plateau Central	0.415***	0.162***	0.0339***	-0.0175***	0.148***	0.0302*
	(0.0541)	(0.0328)	(0.00755)	(0.00629)	(0.0168)	(0.0172)
Higher Plateau East	0.181***	0.0265*	-0.00439	0.00383	0.0839***	0.00961
	(0.0566)	(0.0158)	(0.00535)	(0.00902)	(0.0169)	(0.0149)
Higher Plateau West	0.276***	0.0829***	0.00819	-0.00968	0.172***	0.0893***
	(0.102)	(0.0230)	(0.00781)	(0.00706)	(0.0248)	(0.0269)
South	0.156***	0.0893***	0.0628***	0.0462***	0.0850***	0.0959***
	(0.0403)	(0.0216)	(0.00925)	(0.0135)	(0.0136)	(0.0271)
<b>Mother's Education (ref. Without instruction)</b>						
Primary	-0.0955***	-0.0141***	-0.0237***	-0.0127***	-0.0468***	-0.0147***
	(0.0181)	(0.00459)	(0.00248)	(0.00483)	(0.00475)	(0.00425)
Below secondary	-0.0882***	-0.0229***	-0.0336***	-0.0134***	-0.0753***	-0.0210***
	(0.0208)	(0.00477)	(0.00296)	(0.00505)	(0.00512)	(0.00456)
Secondary	-0.112***	-0.0249***	-0.0323***	-0.0208***	-0.0817***	-0.0306***
	(0.0208)	(0.00488)	(0.00308)	(0.00497)	(0.00539)	(0.00468)
Higher education	-0.0423	-0.0162**	-0.0272***	-0.0144**	-0.0886***	-0.0408***
	(0.0348)	(0.00647)	(0.00357)	(0.00619)	(0.00518)	(0.00414)
<b>Wealth (ref Poorest)</b>						
Poorer	-0.109***	-0.0266***	-0.0217***	-0.00906*	-0.0372***	-0.0224***
	(0.0176)	(0.00415)	(0.00251)	(0.00501)	(0.00503)	(0.00423)
Middle	-0.119***	-0.0271***	-0.0240***	-0.0155***	-0.0572***	-0.0203***
	(0.0193)	(0.00438)	(0.00298)	(0.00544)	(0.00548)	(0.00460)
Richer	-0.119***	-0.0263***	-0.0268***	-0.0103*	-0.0622***	-0.0287***
	(0.0215)	(0.00480)	(0.00326)	(0.00619)	(0.00592)	(0.00479)
Richest	-0.110***	-0.0312***	-0.0200***	-0.00474	-0.0778***	-0.0300***
	(0.0244)	(0.00513)	(0.00408)	(0.00758)	(0.00639)	(0.00510)
<b>Observations</b>	<b>1534</b>	<b>7185</b>	<b>11247</b>	<b>5866</b>	<b>11271</b>	<b>5870</b>

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

**Source:** Authors' calculations based on MICS 2006-2012.



## ANNEX

**Table 6.** Measures of Inequality (Dissimilarity Indices) by Outcome and Over Time

	<b>2006</b>	<b>2012</b>
<b>Stunting</b>	2.3362*** (0.5912)	1.7969*** (0.5963)
<b>Wasting</b>	0.8108** (0.3509)	0.6848** (0.3639)
<b>Underweight</b>	0.9584*** (0.3314)	0.6352** (0.3248)
<b>Iodized salt</b>		11.2245*** (2.1584)
<b>ECE</b>	34.1346*** (7.4528)	30.8715*** (5.7774)
<b>Development activities</b>	7.9128*** (1.2415)	7.5259*** (1.4167)
<b>Violent discipline</b>	1.7177*** (0.6584)	2.9650 (2.4033)
<b>Child work</b>		8.0752*** (1.4512)
<b>Delivery</b>	2.5731*** (0.8254)	0.8257* (0.5298)
<b>Prenatal</b>	4.9123*** (0.8667)	1.7290** (0.6495)
<b>Full Immunization</b>	5.1661** (2.3029)	1.4927*** (0.5471)

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

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 7.** Measures of Inequality (Dissimilarity Indices) by Outcome and Over Time

	NonStunting		NonWasting		NonUnderweight		IODATION DU SEL	
	2006	2012	2006	2012	2006	2012	2006	2012
<b>Gender</b>								
Male	2.3547 (0.8645)	2.0253 (0.8569)	0.9843 (0.4950)	0.9479 (0.4889)	1.1660 (0.5143)	0.7639 (0.4092)		
Female	2.3122 (0.8120)	1.7249 (0.8077)	0.7256 (0.4884)	0.5164 (0.4931)	0.8639 (0.4899)	0.5216 (0.5210)		
<b>Residence</b>								
Urban	1.8478 (0.7894)	1.7064 (0.6975)	0.7985 (0.4623)	0.7853 (0.4702)	0.8404 (0.4141)	0.7192 (0.4130)		10.2705 (2.1931)
Rural	2.9072 (0.8993)	2.4926 (1.0828)	0.9562 (0.5911)	0.6491 (0.6171)	1.1281 (0.5665)	0.5797 (0.5601)		13.4466 (6.1260)
<b>Region</b>								
North Central	1.2846 (1.2476)	0.5880 (1.0108)	0.4204 (0.5593)	0.4551 (0.6409)	0.5334 (0.5939)	0.4823 (0.7983)		3.8707 (3.7741)
North East	1.5718 (1.7261)	1.9366 (2.0074)	0.6271 (0.9264)	1.0190 (1.2581)	0.3926 (0.9213)	0.6756 (1.3337)		4.6385 (6.8062)
North West	1.7152 (1.5235)	2.5077 (1.9133)	0.8752 (0.9021)	0.6350 (1.1108)	0.8367 (0.7826)	0.8128 (1.0234)		7.1533 (5.2894)
Higher Plateau Central	3.3280 (2.2743)	1.5819 (1.6276)	0.9009 (1.4239)	0.6337 (0.9418)	1.7237 (1.3057)	0.9473 (0.9890)		20.9965 (18.4701)
Higher Plateau East	1.4539 (1.6746)	1.5489 (1.3996)	0.5779 (0.9146)	0.6106 (0.8755)	0.5452 (0.8297)	0.6055 (0.9638)		5.0444 (7.0068)
Higher Plateau West	4.4394 (3.0701)	1.5479 (1.6245)	0.8432 (1.3193)	0.4987 (0.7871)	1.4750 (1.6237)	0.4294 (0.9352)		13.6648 (13.3666)
South	3.2116 (1.6579)	1.9295 (1.5101)	0.8510 (0.9897)	0.7029 (0.9449)	1.4989 (1.2016)	1.1960 (1.0761)		8.0027 (12.5161)
<b>Mother's Education</b>								
Without instruction	3.0250 (1.3654)	2.3486 (1.2984)	0.8495 (0.6479)	0.8497 (0.8268)	1.2609 (0.7481)	1.1499 (0.8749)		12.8820 (2.9138)
Primary	2.2921 (1.5548)	1.7078 (1.4841)	0.8821 (0.8932)	0.5805 (0.7138)	1.1139 (0.8366)	0.6742 (0.6899)		9.6600 (6.0298)
Below secondary	1.8120 (1.1718)	1.8166 (1.1999)	0.7389 (0.6216)	0.9988 (0.6709)	0.8230 (0.7445)	0.8007 (0.6386)		7.2095 (4.5605)
Secondary	1.5729 (1.2751)	2.1485 (1.2054)	1.0636 (0.7760)	0.7888 (0.7248)	0.6926 (0.5971)	0.6790 (0.6897)		9.0228 (13.4860)
Higher education	1.4988 (2.4484)	2.1200 (1.8033)	1.7176 (2.3103)	0.8106 (1.2039)	0.6532 (1.1846)	0.7447 (1.0227)		
<b>Wealth (ref Poorest)</b>								
Poorest	2.5940 (1.8914)	2.7566 (1.3672)	1.0939 (0.9760)	0.9272 (0.9574)	1.3190 (1.0762)	1.2497 (1.0017)		14.4973 (6.9597)
Poorer	3.0398 (1.6197)	1.6233 (1.2680)	0.8850 (0.8190)	0.8653 (0.6988)	1.1440 (0.9781)	0.6777 (0.5939)		11.5176 (6.2772)
Middle	2.6193 (1.4788)	2.1978 (1.4856)	1.1036 (0.7347)	0.8460 (0.8096)	1.0541 (0.7637)	0.7483 (0.7729)		11.1596 (5.7124)
Richer	1.7432 (1.3126)	1.7651 (1.2860)	0.7595 (0.5248)	0.7797 (0.8405)	0.8787 (0.7881)	0.8479 (0.7751)		10.4597 (4.7924)
Richest	1.1120 (1.2524)	2.2212 (1.2063)	1.0448 (0.8231)	0.7197 (0.8224)	0.6141 (0.5698)	0.5605 (0.8112)		7.7086 (4.1690)

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 7 (continued).** Measures of Inequality (Dissimilarity Indices) by Outcome and Over Time

	ECE		Development activities		Violent discipline		Child work	
	2006	2012	2006	2012	2006	2012	2006	2012
<b>Gender</b>								
Male	34.7332 (9.0409)	32.7084 (7.5564)	7.9046 (1.7416)	7.2848 (1.9382)	1.7499 (0.6811)			7.1848 (2.1810)
Female	35.6222 (11.2954)	29.6827 (8.3320)	8.1059 (1.7987)	8.0609 (2.0858)	1.8214 (2.2174)			6.9676 (1.9134)
<b>Residence</b>								
Urban	24.1298 (8.7947)	19.5411 (5.3696)	5.8071 (1.4215)	5.5516 (1.4501)	0.9874 (0.6274)	3.2399 (3.1116)		9.1514 (2.9664)
Rural	43.2509 (16.9578)	37.8795 (20.9984)	8.6792 (2.1892)	9.8605 (2.8672)	2.8077 (1.2099)	4.7670 (10.6552)		9.0447 (1.7859)
<b>Region</b>								
North Central	46.4321 (12.3590)	32.0607 (16.6883)	5.6694 (2.5141)	5.3073 (3.6726)	2.4224 (1.3770)	3.3196 (14.1226)		6.8250 (4.0918)
North East	31.0804 (21.1624)	18.9644 (13.3738)	4.8332 (3.3670)	2.5374 (2.4795)	0.8887 (1.2615)	6.2383 (8.9971)		8.9825 (4.9682)
North West	36.1067 (18.2512)	31.7572 (12.7692)	8.3261 (3.7087)	4.6797 (3.3936)	0.7202 (0.8968)	3.8235 (6.4583)		5.6722 (3.9943)
Higher Plateau Central	43.0633 (28.7747)	43.4739 (20.8873)	10.2870 (4.1799)	11.6023 (5.2772)	1.0684 (1.4144)	6.0811 (12.8843)		6.3050 (4.6317)
Higher Plateau East	40.8007 (27.6102)	36.8673 (15.1163)	9.2417 (4.7808)	10.0667 (4.7444)	0.6842 (1.1475)	4.7947 (8.6481)		7.2112 (3.9241)
Higher Plateau West	39.2316 (40.9848)	39.4359 (23.0522)	7.3652 (5.9585)	10.7592 (4.7908)	0.9115 (1.8269)	2.7823 (5.1689)		8.4273 (4.1660)
South	20.1519 (13.7347)	21.8173 (8.5882)	7.8708 (3.4505)	5.4878 (3.9230)	1.4610 (1.2166)	2.6226 (5.7679)		4.1237 (2.4691)
<b>Mother's Education</b>								
Without instruction	42.1178 (24.9949)	38.4278 (34.0347)	7.2883 (2.7798)	10.4187 (4.4076)	2.4194 (1.3810)	4.1295 (4.8487)		9.5148 (2.7200)
Primary	24.9717 (20.9946)	32.2906 (21.2316)	6.7459 (2.8738)	7.3684 (3.4428)	2.0174 (1.2343)	3.4913 (4.8799)		8.4409 (3.1499)
Below secondary	22.4259 (15.5789)	21.8960 (10.0252)	7.2079 (2.4031)	5.8139 (2.1552)	1.0334 (1.1197)	4.4032 (6.6012)		9.2609 (3.2758)
Secondary	19.0350 (14.9270)	20.8478 (9.6996)	4.6772 (2.2325)	3.5531 (2.1585)	1.6419 (1.4632)	4.6719 (54.0785)		8.6404 (3.9266)
Higher education	16.6730 (20.6392)	15.9046 (14.4595)	3.0382 (3.7029)	4.2311 (5.4033)	2.0706 (2.6412)			10.6144 (8.6955)
<b>Wealth (ref Poorest)</b>								
Poorest	44.4770 (28.8529)	51.0192 (33.4403)	8.2455 (4.4997)	12.3993 (4.4647)	3.8523 (2.1357)	5.6741 (9.5287)		8.5385 (3.2480)
Poorer	37.3371 (24.9370)	29.1708 (18.9151)	8.1612 (3.9396)	7.8511 (3.3008)	1.3679 (1.2785)	1.9006 (6.4247)		8.9074 (3.6656)
Middle	27.0040 (20.3160)	25.4960 (12.6622)	4.4622 (2.9142)	5.8689 (3.5827)	2.0022 (1.5264)	2.4564 (4.9665)		8.3321 (3.5621)
Richer	16.1344 (14.9008)	23.8986 (10.8490)	5.0612 (2.5229)	5.1218 (2.8769)	1.3309 (1.2367)	5.1413 (6.0230)		10.7781 (3.0695)
Richest	16.4779 (12.0654)	15.4291 (8.5990)	4.0087 (2.4271)	2.8675 (1.8975)	0.9119 (1.1310)	4.0509 (7.6375)		8.7006 (3.7095)

**Source:** Authors' calculations based on MICS 2006-2012.

## ANNEX

**Table 7 (continued).** Measures of Inequality (Dissimilarity Indices) by Outcome and Over Time

	Delivery		Prenatal		Full Immunization	
	2006	2012	2006	2012	2006	2012
<b>Gender</b>						
Male					5.6328 (3.7239)	1.4607 (0.7136)
Female					5.2002 (2.9904)	1.6429 (0.7818)
<b>Residence</b>						
Urban	0.7799 (0.4370)	0.8526 (0.7953)	2.8625 (0.8478)	1.2922 (0.7450)	3.1118 (2.7153)	1.3021 (0.7053)
Rural	3.9078 (1.2625)	1.1870 (1.1854)	6.4989 (1.3721)	2.5798 (1.2030)	8.9926 (4.8998)	2.1047 (1.0001)
<b>Region</b>						
North Central	3.1081 (2.1637)	0.7926 (1.6723)	3.6632 (2.0981)	1.5668 (2.5380)	2.6075 (3.7874)	0.5985 (1.0191)
North East	1.9648 (1.8759)	0.5346 (1.6407)	6.6816 (3.1846)	1.4180 (2.3467)	3.9116 (6.2734)	0.8287 (1.3968)
North West	1.3638 (1.2677)	0.9802 (1.8208)	3.4906 (1.8749)	1.9405 (2.4079)	6.6315 (8.3450)	1.7336 (2.7839)
Higher Plateau Central	5.0791 (2.4345)	1.0201 (1.8159)	8.2693 (2.6580)	1.6175 (2.1144)	22.7822 (12.1035)	4.0675 (3.4331)
Higher Plateau East	1.0160 (1.2248)	0.7918 (1.5022)	4.3578 (2.5836)	0.5910 (1.1398)	12.3340 (10.9634)	0.8138 (1.1259)
Higher Plateau West	2.4662 (2.2972)	1.1604 (1.5428)	5.3795 (3.7753)	2.5874 (2.2457)	14.6837 (16.3044)	1.7192 (1.7414)
South	4.5440 (1.7754)	3.0842 (2.1496)	5.8172 (2.1355)	3.9621 (3.2021)	7.5846 (6.4662)	2.1717 (1.8880)
<b>Mother's Education</b>						
Without instruction	4.4659 (1.8595)	2.2692 (1.6554)	5.3317 (2.0231)	3.1848 (2.2563)	12.6668 (7.0402)	2.9399 (1.8584)
Primary	0.9630 (0.7030)	1.5505 (2.0888)	3.0830 (1.5761)	2.0531 (1.8723)	4.5083 (5.2174)	1.7994 (1.1995)
Below secondary	0.6931 (0.6947)	1.0476 (1.3707)	1.7935 (1.0078)	1.3450 (0.8291)	3.0489 (3.7943)	1.3458 (1.1071)
Secondary	0.4146 (0.4878)	0.8135 (1.6829)	1.2187 (0.9325)	1.0630 (1.6695)	4.5929 (5.4006)	1.1094 (1.1020)
Higher education	0.4247 (2.4514)	1.0094 (1.3735)	0.8123 (2.4909)	1.0395 (2.7776)	3.8237 (8.9442)	1.1225 (2.4919)
<b>Wealth (ref Poorest)</b>						
Poorest	5.5416 (2.5483)	2.0799 (1.8883)	6.4472 (2.6996)	2.7516 (2.0737)	15.9264 (9.4097)	3.5499 (1.9727)
Poorer	1.4708 (0.9190)	1.0853 (1.6792)	4.1236 (1.8154)	1.5048 (1.2424)	7.3158 (8.7524)	1.5681 (1.0885)
Middle	1.4940 (1.0696)	0.8496 (2.1858)	2.7662 (1.4894)	1.5732 (1.5154)	3.3117 (3.6649)	1.1100 (0.9691)
Richer	0.6340 (0.6317)	0.9233 (1.6997)	2.3927 (1.6439)	0.9562 (1.0166)	3.8383 (3.7972)	0.9875 (1.2563)
Richest	0.5424 (0.6697)	0.5547 (1.5404)	1.4569 (0.9356)	0.8093 (1.5486)	3.6395 (5.1341)	0.9870 (1.3040)

**Source:** Authors' calculations based on MICS 2006-2012.

## References

- Assaad R. (2013). Equality for All? Egypt's Free Public Higher Education Policy Breeds Inequality of Opportunity. In A. Elbadawy (Ed.), *Is There Equality of Opportunity under Free Higher Education in Egypt?* New York, NY: Population Council.
- Assaad R., Krafft C., Hassine N. B., Isfahani, D.S. (2012). Inequality of Opportunity in Child Health in the Arab World and Turkey. *Middle East Development Journal*, 4(2), 1–37.
- Assaad Ragui., Hassine N.B., and Isfahani D.S. (2012). Equality of Opportunity in Educational Attainment in the Middle East and North Africa, ERF Working Paper 689. Economic Research Forum.
- Azevedo J.P., Franco S., Rubiano E., Hoyos A. (2010). HOI: Stata module to compute Human Opportunity Index. *Statistical Software Components*, Boston College, Department of Economics.
- Boucherf K, 2014. Le travail des enfants en Algérie : entre stigmatisme de la pauvreté et stratégies familiales, *Cahiers du Cread*, N°107-108.
- Bourguignon, François, Francisco Ferreira and Marta Menendez. (2007). "Inequality of Opportunity in Brazil", *Review of Income and Wealth*, 53 (4): 585-618.
- Bourguignon, François, Francisco H.G. Ferreira and Marta Menéndez. (2003). "Inequality of Outcomes and Inequality of Opportunities in Brazil", *World Bank Policy Research Working Paper #3174*. Washington, DC. (December).
- Brunori P & all. (2013). Francisco H. G. Ferreira Vito Peregrine Inequality of Opportunity, Income Inequality and Economic Mobility: Some International Comparisons, *IZA DP No. 7155*.
- De Barros R.P., Ferreira F.H.G., Vega J.R.M., Chanduvi J.S. (2009). *Measuring Inequality of Opportunities in Latin America and the Caribbean*. Washington, DC: World Bank.
- De Barros R.P., Ferreira F.H.G., Vega J.R.M., Saavedra J. (2008). *Measuring Inequality of Opportunities for Children*. Washington, DC: World Bank.
- Deutsch J., Silber J. (2008). On the Shapley value and the decomposition of inequality by population subgroups with special emphasis on the Gini index. In G. betti & A. Lemmi (Eds), *Advanced on Income Inequality and Concentration Measures* (pp. 161-178). New York, NY: Routledge.
- El-Kogali S., Krafft C., Abdelkhalik T. Benkassmi M., Chavez M., Bassett L. and Ejjanoui F. (2016). *Inequality of Opportunity in Early Childhood Development in Morocco over Time*, Policy Research Working Paper 7670, World Bank Group.
- Engle, P. L., Fernald, L. C. H., Alderman, H., Behrman, J. R., O'Gara, C., Yousafzai, A., de Mello, M. C., Hidrobo, M., Ulker, N., Ertem, I., & Iltus, S. (2011). Strategies for Reducing Inequalities and Improving Developmental Outcomes for Young Children in Low-Income and Middle-Income Countries. *Lancet*, 378(9799), 1339–53.
- Filmer, D., & Pritchett, L. (2001). Estimating Wealth Effects Without Expenditure Data--Or Tears: An Application to Educational Enrollments in States of India. *Demography*, 38(1), 115–132.
- Glewwe, P., Jacoby, H. G., & King, E. (2001). Early Childhood Nutrition and Academic Achievement: A Longitudinal Analysis. *Journal of Public Economics*, 81(3), 345–368.
- Grantham-McGregor, S., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L., Strupp, B., & International Child Development Steering Group. (2007). Developmental Potential in the First 5 Years for Children in Developing Countries. *Lancet*, 369, 60–70.
- Heckman J., Masterov D.V. (2007). The Productivity Argument for Investing in Young Children, *Review of Agricultural Economics—Volume 29, Number 3—Pages 446–493*.
- Heckman J. (2006). Skill Formation and the Economics of Investing in Disadvantaged Children. *Science*, 312(5782), 1900–2.

- Helmerts C., Patnam M. (2011). The Formation and Evolution of Childhood Skill Acquisition: Evidence from India. *Journal of Development Economics*, 95(2), 252–266.
- Hoddinott J., Maluccio J. A., Behrman J. R., Flores R., Martorell R. (2008). Effect of a Nutrition Intervention during Early Childhood on Productivity in Guatemalan Adults. *Lancet*, 371(9610), 411–6.
- Kirksey, A., Wachs, T. D., Yunis, F., Srinath, U., Rahmanifar, A., McCabe, G. P., Galal, O. M., et al. (1994). Relation of maternal zinc nutriture to pregnancy outcome and infant development in an Egyptian village. *The American Journal of Clinical Nutrition*, 60(5), 782–92.
- Krafft C., El-Kogali S. (2014). Inequalities in Early Childhood development in the Middle East and North Africa, ERF working paper.
- Krafft C., (2015). The Determinants of Child Health Disparities in Jordan, ERF working paper.
- Musette M.S. (2004). Travail des enfants en Algérie, Cahiers du Cread.
- Nores M., W.Barnett. (2010). Benefits of early childhood interventions across the world: (Under) Investing in the very young, *Economics of Education Review*, vol. 29, issue 2, 271-282.
- Paxson C., Schady N. (2007). Cognitive Development among Young Children in Ecuador: The Roles of Wealth, Health, and Parenting.
- Qian M., Wang D., Watkins W. E., Gebiski V., Yan Y. Q., Li M., Chen Z. P. (2005). The Effects of Iodine on Intelligence in Children: A Meta-Analysis of Studies Conducted in China. *Asia Pacific Journal of Clinical Nutrition*, 14(1), 32–42.
- Rutstein S., Johnson K. (2004). The DHS Wealth Index. DHS Comparative Reports No. 6. Calverton, Maryland.
- Sala-i-Martin, X., Doppelhofer, G., & Miller, R. I. (2004). Determinants of long-term growth: A Bayesian Averaging of Classical Estimates (BACE) approach. *The American Economic Review*, 94(4), 813–835.
- Sorrocks A.F. (2003). Decomposition Procedures for Distributional Analysis: A Unified Framework Based on the Shapley Value. *The Journal of Economic Inequality*, 11(1), 99- 126.
- Roemer J. (1998). *Equality of Opportunity*. Cambridge, MA: Harvard University Press.
- Shonkoff J. P., Phillips D. (Eds.). (2000). *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Washington, DC: National Academy Press.
- Shorrocks A. F. (2013). Decomposition Procedures for Distributional Analysis: A Unified Framework Based on the Shapley Value. *Journal of Economic Inequality*, 11(1), 99–126.