Child Poverty in Egypt's Poorest Villages:
A Multilevel Logistic Model

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Abstract

Poverty in Egypt is widespread all over the country and has been increasing during the last decade from around 16.7% in 2000 to reach 26.3% in 2013.[4] The single largest population group in Egypt is the children (17 years and below). They represent 37 % of the population overall Egypt, whereas they represent 48.3 % in the poorest 1000 villages survey.[5] The importance of focusing on childhood rises from that early stage formulates children's development. Unlike adults, children are vulnerable to any deprivation in this stage as its impact might be long lasting and could have an inter-generational effect. The purpose of the study is to compare the results that illustrate multidimensional child poverty in the poorest villages with the results of the national level to know if children in these regions are deprived of the same rights the children at the national level are deprived of or not. Comparison will also be made with the rural regions in Upper and Lower Egypt. This is important to design specific programmes to children living in these villages in case of significant differences. In order to accomplish this objective, the paper is organized as follows. Section 1 reviews the literature. Section 2 explains the methodology implemented and describes the data used in the study. Section 3 covers the descriptive part of child poverty in the studied sample compared with the national level. The main results of multilevel analysis are presented in Section 4 followed by a discussion that concludes and suggests avenues for further experiments.

المستخلص

ينتشر الفقر على نطاق واسع في شتى أنحاء مصر. وفي خلال العقد الماضي استمرت نسبة الفقر في الارتفاع من نحو

١٦,٧ ٪ عام ٢٠٠٠ إلى ٢٦,٣٪ عام ٢٠١٣. وتُعد فئة الأطفال (١٧ سنة فأقل) هي الفئة الأكبر بين السكان في مصر

حيثُ يشكلون ٤٨,٣ ٪ من سكان القرى الأكثر فقراً. وترجع أهمية التركيز على مرحلة الطفولة إلى أن هذه

المرحلة المبكرة من عمر الطفل هي التي تشكل قدراته ونموه. وعلى عكس البالغين، يكون الأطفال أكثر

عرضه للحرمان في هذه المرحلة، وقد يمتد أثر هذا الحرمان لمدة طويلة وعبر الأجيال. وتستهدف هذه الدراسة

مقارنة النتائج التي تشرح فقر الأطفال متعدد الابعاد في القرى الأكثر فقراً بالنتائج على المستوى القومي بغية

معرفة ما إذا كانت الحقوق التي يُحرم منها الأطفال في هذه المناطق هي نفسها التي يُحرم منها الأطفال على

المستوى القومي أم لا. وإلى جانب ذلك تجري المقارنة مع المناطق الريفية في كل من صعيد مصر وريف الوجه

البحري. وهذا مهم في تصميم برامج للأطفال الذين يعيشون في هذه القرى في حالة وجود فروق معنوية بين هذه

المناطق. وتحقيقاً لهذا الهدف تُقسم الدراسة كالتالي: في القسم الأول يتم عرض الأدبيات التي تتناول هذا الموضوع.

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[4] CAPMAS report for HIECS (Household Income, Expenditure and Consumption Survey) 2012/2013, using the national lower poverty line.
[5] The Egyptian government initiated in 2007 the poorest 1000 villages' initiative in six governorates (Menia, Assiut, Sohag and Qena from Upper Egypt and Sharkia and Behera from Lower Egypt). The baseline study, which describes the socio-economic status of the villages, reports that 84% of the residents in the 151 intervention villages of the first phase of the initiative are poor.

وِيْ القسم الثاني يتم شرح المنهجية المتبعة ووصف البيانات المستخدمة ـفي الدراسة. ويغطى القسم الثالث الجزء الوصفي لفقر الأطفال من خلال العينة التي شملتها الدراسة ومقارنة ذلك بالمستوى القومي. وِيْ القسم الرابع يتم عرض النتائج الاساسية للتحليل متعدد المستويات، ويتبع ذلك قسم يتناول الخلاصة والتوصيات.

1. Introduction

Recently, researchers started to study and analyse the phenomena of child poverty separately from the poverty theme (e.g. Gordon et al. 2003a, Gordon et al. 2003b, Minujin et al., 2005).

The monetary approach in measuring poverty is criticized by the fact that, in case of improvement, it does not reflect that every household member is better off even easily satisfies his/her needs. In addition, nothing guarantees that the increased income will be used for child relevant expenditures. Moreover, this improvement could be resulting from making vulnerable members work in an inappropriate job like engaging children in paid work and thus depriving them from their rights.

Setting a poverty income threshold is also criticized, as it could lead to incorrect policy implications. As this threshold corresponds to the expenditure necessary to buy a minimum standard of nutrition only without taking into account the numerous additional basic needs that require expenditure in both health and education. Availability of infrastructure and services in health and education should be considered more in developing countries and especially in poor households with young children.

Focusing on child poverty rather than overall poverty is originated to rectify a false perception which states that children are assumed to share their household members equally either in their fortune or misfortune. Actually, childhood is the most vulnerable stage of life in which any exploitation or abuse can occur. Accordingly, a special attention must be given to children because any damage or deprivation in early stages often cannot be repaired later in life (long-lasting effect on children) and thus could impact their ability to exit this vicious circle. And still, the same challenges faced by poor children and poor adults need to be faced by different solutions, for example any short term fiscal "austerity" will have long term impact on children.[6]

The review of the existing child poverty approaches shows that there is already a new trend to align child poverty measurement with the child rights approach (Minujin, a. et al. (2005) and Roelen and Gassmann (2008)). Thus, issues of multidimensionality in the area of child poverty become now of greater importance, especially in developing and poor countries. (Trani et al. 2013, Roche 2013.)

Recently, two main approaches **(Bristol and Alkire)** were developed to conceptualize the multidimensional child poverty in developing countries.

The first approach **"Bristol"** consists of developing a "counting" method through which we can identify the poor according to the total number of dimensions of which they are deprived. Gordon (2003) defines a set of basic needs that a child should have access to, and in case of its nonexistence, the child is considered deprived of one or many dimensions.

Methodologically, what we can infer is that it is a simple and absolute poverty count measure which could be compared with the traditional poverty headcount ratio.

Bristol approach depends on seven main dimensions. The definition of each dimension is composed of more than one indicator to represent the deprivation of different age category within the same dimension. Looking at the dimensions, they can be classified into two main classes: one related to the household characteristics in which the child lives and one related to the child characteristics himself.

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[6] "Understanding multidimensional child poverty", Module 3.

Figure 1. Classification of Child Deprivation
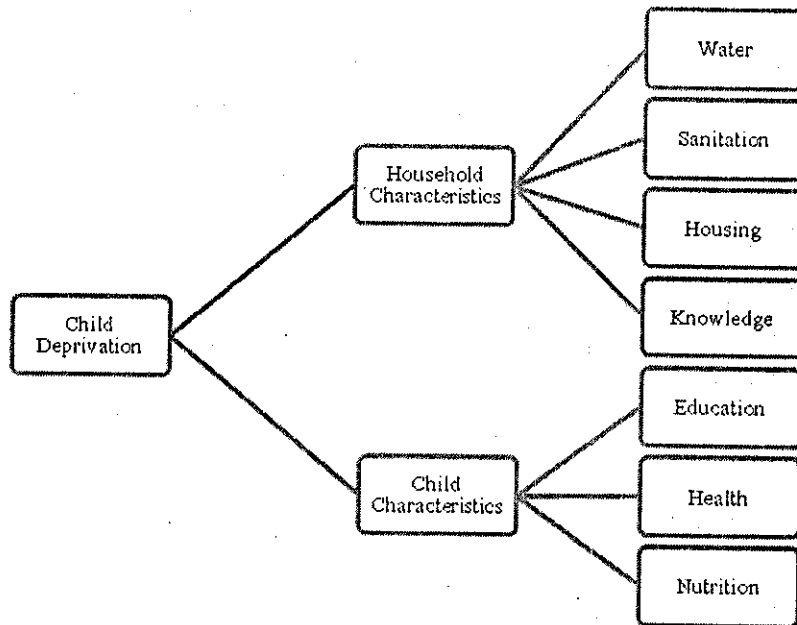
In the table shown below, we mentioned the definition of each deprivation according to the Bristol approach. In the second column, we used the suggested new definition related to each dimension[7]. That is for two reasons. On one hand, new indicators are needed specially to be relevant to the Egyptian context. On the other hand, we must ensure that the indicators could be constructed from the different data sets that will be used in our analysis plus capturing the vulnerable children who are not addressed by Bristol definitions at all.

Table 1. Deprivation Dimensions According to Bristol Definition and the New Definition

Dimension	Bristol Definition to capture deprivation	New definition to capture deprivation
Water	Deprived children are those between 0-17 years who are living in households where they cannot access safe drinking water (limited to surface water in this case) or those who live in households where they spend 30 minutes or more to get water from the nearest source and come	Deprived children are those between 0-17 who are living in households with no connection to piped public water into residence
Sanitation	Deprived children are those between 0-17 years with no access to a toilet of any kind in the vicinity of their dwelling at all	Deprived children are those between 0-17 years with no access to pit latrine, bucket toilet or any facility or use shared toilet with other households.

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[7] Most of the suggested new definitions are retrieved from the paper of "Towards a New Definition of Child Poverty Indicators in Egypt (Sensitivity Analysis)".

Dimension	Bristol Definition to capture deprivation	New definition to capture deprivation
Housing	Deprived children are those who live in dwelling with 5 people or more per room or when there is no flooring material	Deprived children are those who live in dwelling with 4 people or more per room or when there is no flooring material
Knowledge	Deprived children are those who are above 2 years with no access to radio, TV, telephone (land or mobile phone) or computer	Children less than 3 years with uneducated or illiterate mothers, or those who are between 3-5 with no TV or radio, or those who are between 6-11 with no TV or radio or computer or those teenagers between 12-17 with no access to radio or computer or TV or mobile phone
Education	Deprived children are those who are between 7-17 and had never been to school and are not currently attending school	The same definition
Health	Deprived children are those who are under 5 and had not been immunized against any diseases or had a recent illness involving diarrhea without receiving any medical advice or treatment	Deprived children are those between 2-4 and are not fully immunized or those between 0-4 and suffered from an illness (diarrhea or pneumonia) without receiving any medical advice or treatment
Nutrition	Deprived children are those who are under 5 whose heights and weights for their age are more than -3 standard deviation below the median of the international reference population	Deprived children are those who are under five and whose height and weight for their age are less than -3 standard deviation below the median of the international reference population, or those who are under 5 and had never breastfed at all, or those who are between 5-17 and suffered from underweight

Regarding the *other* approach, it presents a step further than reporting the children who have been identified as multidimensional poor. So in order to specify the poorest children of all, Alkire method (Alkire and Roche 2011) developed a measure that reflects the intensity of multidimensional poverty. In other words, it accounts if a child becomes deprived in an additional dimension or if the deprivation in a specific dimension is very apparent.

In Egypt, the first comprehensive study that focused on child poverty using the rights-based framework was the paper of "Child Poverty and Disparities in Egypt", launched in 2010 by the UNICEF. However, it was done at the national level, but here the focus is on the poorest villages compared with the national level. Therefore, in a context where there has been no previous attention to multidimensional child poverty in the poorest villages, this paper will try to fill this gap.

2. Framework and Methodology

After reviewing child poverty-measuring literature, this paper choses to follow the Bristol approach in a very simple manner. However, new suggested definitions will be calculated side by side to Bristol definitions.

Then, in order to identify the factors that cause a child to fall into poverty, multivariate analysis will be applied using *multilevel logistic regression approach*. While the child characteristics represent the main layer of the multilevel analysis, household characteristics and villages (place of resident) characteristics is going to be used to identify different level of effects on the child welfare.

The data utilized in this paper has a hierarchical structure nature. Children in the poorest 1000 villages' survey are clustered -by design- according to their mothers, household and villages they live in. And that is what makes ordinary one level multivariate analysis is not sufficient for studying children welfare in these villages, as it assumes independency between observations with uncorrelated error terms. But in our case, the children within the same household/village are sharing some characteristics which make independency assumption not applicable and may lead to wrong estimates.

Household has been selected to identify the first clustering level instead of mothers, as belonging to the same household overcomes the influence of having the same mother. Also neglecting correlation between children of the same households with different mothers will get the model back to higher error term.

Since the purpose of the model is to identify the deprived child characteristics, the dependent variable is binary, with value equals to 1 when the child is identified as deprived and zero otherwise. Now given the data structure and the research question, multilevel mixed effects logistic regression model has been applied. The selected approach allows examining two types of effects: fixed and random effects. As mentioned before, two clustering levels are considered: the first is household ID and the other villages ID. Moreover, child characteristics are included as regressors in the used model.

The model is specified as follows: this is the specification of the two level random intercept logit model for being a child deprived (of two or more dimensions), where the children i are nested in households and households j are nested in villages k:

$$\text{logit}\{\Pr(y_{ijk} = 1 \mid x_{ijk}, \zeta_{jk}^{(2)}, \zeta_k^{(3)})\} = \beta_1 + \beta_2 x_{2ijk} + \cdots + \beta_{11} x_{11.k} + \zeta_{jk}^{(2)} + \zeta_k^{(3)}$$

$$= (\beta_1 + \zeta_{jk}^{(2)} + \zeta_k^{(3)}) + \beta_2 x_{2ijk} + \cdots + \beta_{11} x_{11.k}$$

Where $x_{ijk} = (x_{2ijk}, \ldots, x_{11.k})'$ is a vector containing all covariates, $\zeta_{jk}^{(2)} \mid x_{ijk}, \zeta_k^{(3)} \sim N(0, \psi^{(2)})$ is a random intercept varying over households and $\zeta_k^{(3)} \mid x_{ijk} \sim N(0, \psi^{(3)})$ is a random intercept varying over villages. Both random effects are assumed independent of each other and across clusters, and $\zeta_{jk}^{(2)}$ is assumed independent across units as well.

The investigated factors in the model are divided into three major groups. First, the child characteristics, and whether poverty differs by the gender or the age of the child, in particular in the educational, health, and nutritional deprivations. The second level will be the household characteristics and its structure and how they affect the children's risk of being poor, especially in the dimensions of water, sanitation, housing and knowledge. Household characteristics capture the cultural and economic environment the child is growing in. These variables cover the head of household characteristics, gender, age, education, and employment, as well as the household size. In order to capture the impact of having a stable and regular income on the quality of living, the percentage of permanent workers within family is also included .

Most of the studies include wealth index, but since it is usually constructed based on assets and housing characteristics which are represented in deprivation dimensions, a new index is constructed based on assets that are not used in any deprivation dimension and reflect the economic status of the household using factor analysis.

Finally the level of the community, represented by the village in our data, investigates how the access to different facilities may have a great impact on the ability of escaping poverty in particular the schools and health units. Poor neighbourhood may always have culture norms and economic conditions that influence the households in housing nature, educational valuing, and health habits. Different variables were used to investigate the importance of the availability of facilities on reducing the child poverty, such as the presence of primary schools and health unit, in addition to the distance to the nearest big city (Markaz), the area of the agriculture land within the village, and finally the population density within the village.

Figure 2. The Framework of the Multilevel Analysis
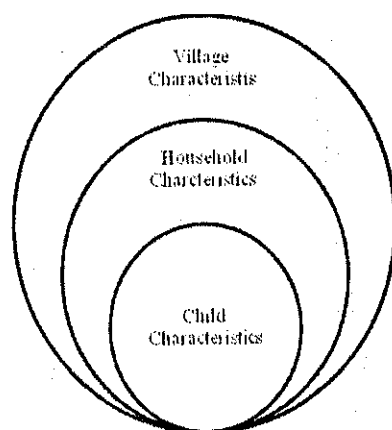
Due to the fact that almost all villages have health unit and primary schools, the two variables were excluded from the model. The built-in command of STATA 12 (xtmelogit) (Rabe-Hesketh and Skrondal, 2012) was used and random intercept were assumed for both, villages level and household level.

3. Data Source

This study analyses data from the survey that was conducted as part of the monitoring and evaluation system with regard to the poorest 1000 village government initiative in Egypt. The first phase of the initiative consisted of choosing the poorest 151 villages according to the poverty map definition (designed by the World Bank and the Egyptian Ministry of Planning). Using the selected 151 villages in addition to 35 more control villages,[8] they were able to conduct a household survey in the period between November-December 2009. This was followed by a community survey completed in March 2010 in all the 186 villages. Then in January 2011, data for the Maternal and Child Health (MCH) survey were collected in 86 villages with 4717 households. The total number of children was 10305. Women were interviewed using the women questionnaire to capture data like pregnancy and postnatal care as well as immunization and health data. Furthermore, the height and weight measurements of 4717 eligible children were taken. Finally, 5069 children were tested for Anaemia.

The household and the women questionnaires were comparable with the Demographic and Health Survey (DHS) of Egypt in 2008. For this reason, we will depend in our comparison on the (DHS) to represent the national level and on the initiative's surveys to represent the poorest level.

It must be noted that 82% of the poorest 1000 villages are located in the rural Upper Egypt while only 3% are located in rural Lower Egypt. This fact explains why most of the children in our sample are coming from Upper Egypt (87.3%) and not from Lower Egypt (12.7%).

4. Child Poverty

4.1. Single Dimension Deprivation

Figure (3) emphasizes the differences in child deprivations according to households' dimensions and by using different definitions. Taking the water deprivation as the first dimension of the household characteristics, the calculations are restricted to the suggested definition only; as the construction of Bristol indicator required more information than what is available in the MCH data set. It was found that 7.44% of children in the poorest villages live in households that are not connected to piped public water. This number is not very far from the one representing all the children of Egypt which is calculated from the DHS (9.74%). The interesting point is to see that the children in rural areas, and particularly in rural Upper Egypt, are still more deprived of adequate water services than children in the poorest villages. Data calculated from the DHS shows that 17% of children in rural Upper Egypt are deprived from this service. This percentage decreases to 12% in case of rural Lower Egypt.

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[8] Generally from the poor villages but not from the poorest villages chosen in the initiative.

In sanitation, data allowed to construct both definitions. Using the ordinary Bristol one, 0.25% of children in the poorest villages have no access to a toilet of any kind. This number increases to 0.40% when talking about the national level. This upward shift could be due to the relatively high sanitation deprivation level in rural Upper Egypt, which is 1.16%. This is not the case using the other definition. As mentioned before, deprivation according to this new definition occurs when children have no access to pit latrine, bucket toilet or any facility or in case of shared toilet with other households. This broad definition makes the percentage of deprived children rise largely; from a level of deprivation of 0.25% to a level of 22.43%. The reason behind this shift is that in the new definition the shared toilet is considered as a source of deprivation (around 15% have a shared toilet).

When comparing this percentage with the national level, it is clear that these poor villages need a specific focus on the sanitation dimension. No more than 5.19% of the children on the national level are affected by poor sanitation. In rural Lower Egypt, the situation is much better with 2.9% of the children are deprived. Moreover, although rural Upper Egypt is characterized by a high level of child deprivation that is around 11.9%, the poorest villages remain the first priority for intervention regarding this dimension with 22.4%. Furthermore, among the poorest villages, the deprivation is not uniform between the governorates. Villages from Qena (rural Upper Egypt) is the worst case with a sanitation deprivation of around 33.5% while it is not too much apparent for example in Behera with only 2.6% (rural Lower Egypt).

The main challenge faced is the housing deprivation of which approximately half of the poor children are suffering. Using Bristol definition, 47.67% of the children in the poorest villages suffer from crowdedness or from not having flooring materials in their households. Like the sanitation deprivation, the national level does not reflect this huge lack as data show that 14.86% of overall children suffer from this dimension. Only 8.08% of children in rural Lower Egypt are disadvantaged compared to 37.23% in rural Upper Egypt. This is also reflected in the poorest villages as deprivation in villages from Upper Egypt reaches around 65% (in Menya governorate) compared to around 8-9% among villages from Lower Egypt governorates (Behera and Sharkeya). Changing the threshold of crowdedness from 5 or more members per room to 4 or more members per room resulted in slight differences as seen in Figure (3).

Concerning the knowledge deprivation, 1.61% of the children above 2 years in the poorest villages live in households with no access to radio, TV, telephone (land or mobile phone) or computer. This percentage is less than what is calculated from the DHS for all over Egypt and for rural Lower Egypt. However, the children in rural Upper Egypt are the most deprived with a total percentage of 6.22%. Once the new indicator is adjusted so that it could capture each age category separately, the percentage of deprived children increases on all levels. This shift could be explained since children under three with uneducated or illiterate mothers are considered deprived. In other words, including the education of the mother increases the incidence of deprivation. In the poorest villages, it is about 11.13% of the children are deprived from knowledge. Again, the national level and the rural Lower Egypt registered a relatively low percentage of 7.70% and 5.31% respectively leaving rural Upper Egypt with the highest percentage of deprivation that is about 16.17%. Finally, it must be noted that, relying on both definitions, no wide disparities is observed between the six governorates on the poorest villages' level.

Table 2. The Percentage of Deprived Children by Household Deprivation according to Bristol and the Adjusted Definition

	Poorest Villages	Total Egypt	Rural Lower Egypt	Rural Upper Egypt
Water deprivation: adjusted definition	7.44%	9.74%	11.90%	16.95%
Sanitation deprivation: Bristol	0.25%	0.40%	0.11%	1.15%
Sanitation deprivation: adjusted definition	22.43%	5.19%	2.93%	11.93%
Housing deprivation: Bristol	47.67%	14.86%	8.08%	37.23%
Housing deprivation: adjusted definition	49.07%	16.44%	8.87%	39.65%
Knowledge deprivation: Bristol	1.61%	2.44%	1.03%	6.21%
Knowledge deprivation: adjusted definition	11.13%	7.70%	5.31%	16.17%

Source: Authors' calculations based on DHS 2008 and MCH 2011 data sets.

Figure 3. Illustrating the Household Deprivation by Dimension and Definition
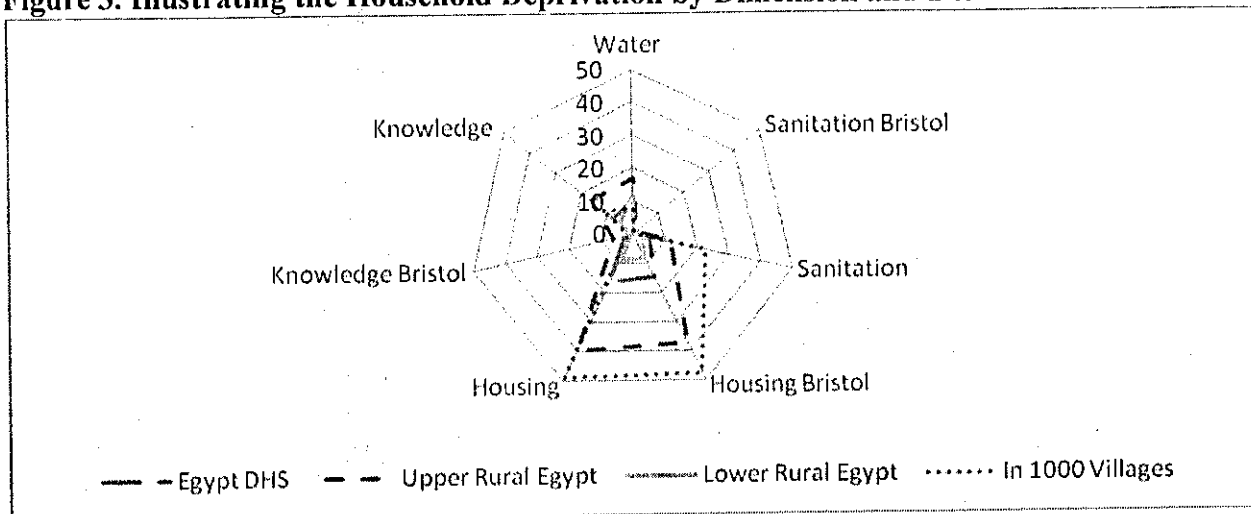
Source: Authors' calculations based on DHS 2008 and MCH 2011 data sets.

Shifting to the individual characteristics in Table(3), 7.15% of the children between 7-17 years old in the poorest villages did not receive education of any kind, using the DHS results, its corresponding national level is about 3.98%. Rural Upper Egypt registered the highest percentage of education deprivation (8.11%).

Overall, 5.68% of the children between 7-10 years old in the poorest villages had never attended school before. This percentage is almost double (10.17%) in the age category of 15-17. The only explanation for this could be the fact that education deprivation has been declining over time in these villages.

For the health deprivation, we found that 1.08% of the children under 5 in the poorest villages had not been immunized against any diseases or had a recent illness without receiving any medical advice or treatment. This percentage is lower than the corresponding national level which is equal to 2.81%. The possible explanation for this is the great role that the family support center and the women development center play in these villages. Due to social bonds within each community, workers in such centers succeed in reaching women to provide them with the exact schedule for all vaccinations for their children.

Using the adjusted definition, 5.79% of the children in the poorest villages are deprived. This shift occurs because not all the children between 2-4 are fully immunized. Accordingly, special attention must be given to regular follow up especially in the poorest villages to ensure that the child completed all the required vaccinations.

The national level registered a lower percentage (4.02%) which indicates that, overall Egypt, women are more likely to be keen in letting their children complete the immunizations.

The final dimension is the nutrition one. About 14.73% of the children under 5 in the poorest villages were less than -3 standard deviation below the median of the international reference population. This percentage is lower than the national level (17.19%). Consuming more green vegetables in the poor areas could explain why the situation is slightly better there.[9] Turning to the adjusted definition, which is constructed as a composite of two groups, the Bristol definition for those who are under 5 and those who suffer from underweight of age 10-17, the percentage decreases to 7.46%. This downward shift concludes that children under 5 suffer more from nutrition deprivation than older children 10-17. The results of the DHS concerning the national level confirm what was previously mentioned using Bristol definition. Again, the deprivation on the national level (9.14%) is higher than in the poorest villages.

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[9] "Assessment of the nutrition for children and adolescents and determining the risk factors in the poorest villages in Egypt".

Lastly, the used data set of the poorest villages–contrary to the DHS data- cover the anthro-parametric measures for children of 5-10 years. Accordingly, deprivation occurs also when children between 5-10 suffer from underweight. The percentage of deprived children shifts from 7.46% to 8.27% in the poorest villages.

Table 3. The percentage of Deprived Children by Child Characteristics according to Bristol and the Adjusted Definition

	Poorest Villages	Total Egypt	Rural Lower Egypt	Rural Upper Egypt
Education deprivation: Bristol definition	7.15%	3.98%.	2.42%	8.11%
Nutrition deprivation: Bristol definition	14.73%	17.19%	21.4%	12.7%
Nutrition deprivation: adjusted definition	7.46%	9.14%	9.83%	8.74%
Health deprivation: Bristol definition	1.08%	2.81%	1.95%	4.32%
Health deprivation: adjusted definition	5.79%	4.02%	2.2%	6.64%

Source: Authors' calculations based on DHS 2008 and MCH 2011 data sets.

4.2. Multidimensional Deprivation Analysis

According to Alkire and Santos (2010) there are three levels to manage while dealing with weights to measure the percentage of multidimensional child poverty.
- Within the same dimension
- Between age categories
- Between dimensions

As shown before, we noticed that some dimensions are composed of more than one indicator to represent the deprivation of different age category within the same dimension. Therefore, to simplify, we preferred to give equal weight for each indicator in each dimension as well as giving equal weight to the different age categories. In other words, the deprivation of the children between 5-10 is treated exactly like the deprivation of under 5 or those between 10-17. No priority is given neither to the most disadvantaged category nor to early childhood.

Another assumption is to give equal weight to all of the 7 dimensions. No relative weight is used for specific dimension even if it is considered relatively more important.

To identify whether the child is poor or not, we used the union approach which is one of the three recognized ways of aggregation. This approach goes for considering the child poor if he/she is deprived from at least two dimensions.[10]

In the previous section and after reviewing each dimension separately, it was shown that some of them did not reflect clearly the deprivation of all age categories. For example, the health dimension did not account for the deprivation of those above 5 years.

Also by default, the under 7 children are not included in the definition of educational deprivation. Consequently, we will represent the next part depending on separating the children under 5 from the children above 5.

Starting by the children under 5 and out of 6 dimensions,[11] only 26.14% of the children are not deprived in the poorest villages. This percentage is almost double (50.41%) at the national level. In general, deprivation is concentrated more around lacking one or two or three dimensions at maximum. Being deprived from one need is approximately similar at the national and the poorest villages level, 32.05% and 30.57% respectively. Differences start to be apparent while comparing the two and three dimension deprivation. While 26.1% of the children are deprived from 2 dimensions in the poorest villages, around 12% of the children are identified on the national level. Slightly less than

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[10] The other 2 approaches are the intersection approach and the cut-off approach. Using the first one, the child is poor if he/she is deprived of all dimensions whereas the other approach depends on setting a cut-off point/threshold according to each dimension.
[11] No educational deprivation is included for this age category. In addition, all calculations are based on the adjusted definition not on the Bristol definition.

half of the poorest children (43.29%) are deprived from 2 dimensions or more compared to the national level with only 17.5%. (Figure (4))

Let us consider a severe deprivation is the case where a child is deprived from 4 dimensions or more. Accordingly, on the poorest villages level, about 4.24% of the children suffer from severe deprivation. However, no child in this age category is deprived from all of the 6 dimensions.

Overall, Figure (5) appears to suggest that the structure of total deprivation in rural Upper Egypt resembles what is present in the poorest villages.

Figure 4. Percentage of Deprived Children under 5 by Number of Deprivations in MCH and DHS
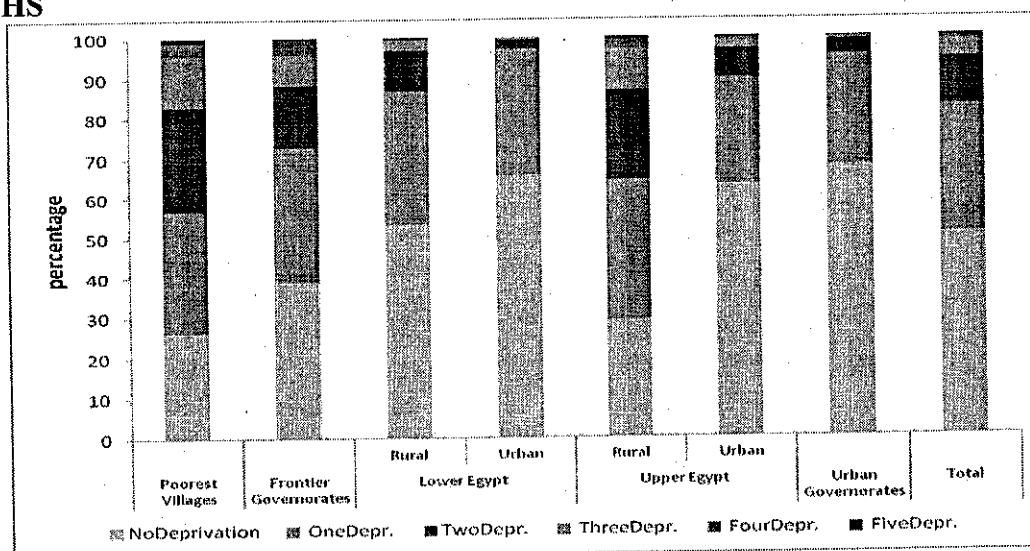
Source: Authors' calculations based on DHS 2008 and MCH 2011 data sets.

Having now a closer look at the calculations related to the children between 5-17, first, we will exclude the health deprivation while aggregating as there is no indicator to capture the health of those who are above 5. Second, we supposed that the children between 5-6, who have not gone to school yet, are not deprived. For simplification, we claimed that they still have a chance to be enrolled. This assumption is in favour of maintaining the education deprivation in our analysis. So again, only 6 dimensions will be aggregated.

Figure 5. Percentage of Deprived Children above 5 by Number of Deprivations in MCH and DHS
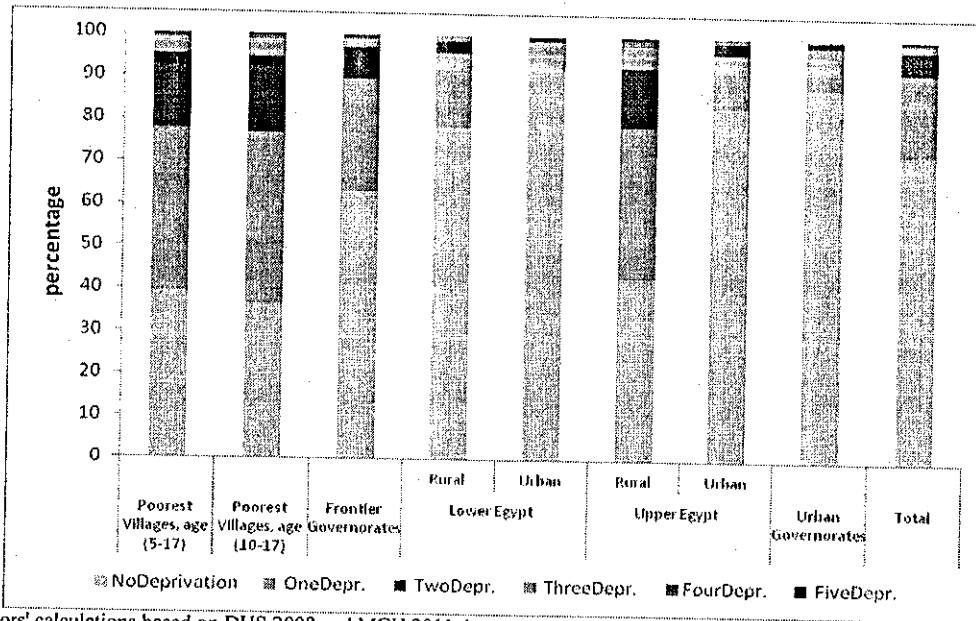
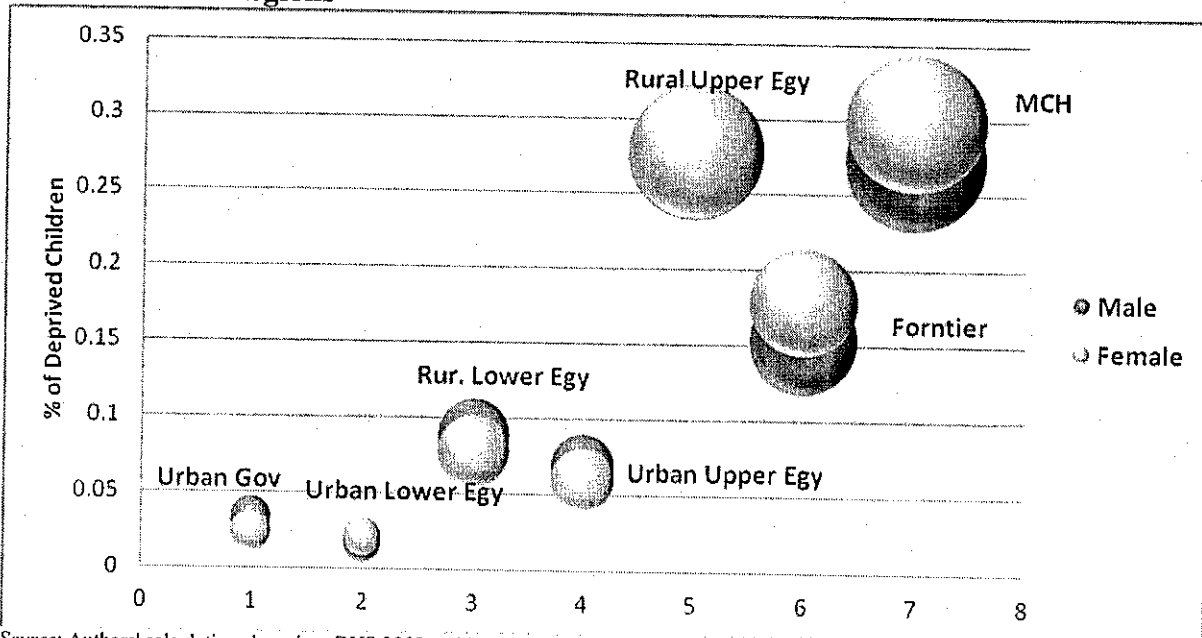*Source*: Authors' calculations based on DHS 2008 and MCH 2011 data sets

4.3. Child Poverty by Regions (DHS and MCH)

At this stage, we decided to consider the child is poor if he/she suffers from 2 or more dimensions.

Figure (6) summarizes the percentage of poor children (2 dimensions or more) by regions according to the DHS and the MCH. As seen, the most suffering region is the rural Upper Egypt, however, the poorest villages in our data have slightly higher percentage.

While there is no significant difference between males and females in rural Upper Egypt, females suffer more in the poorest villages than males.

Figure 6. Percentage of Children (≤ 17 Years) Deprived of Two or More Dimensions in MCH and DHS Regions
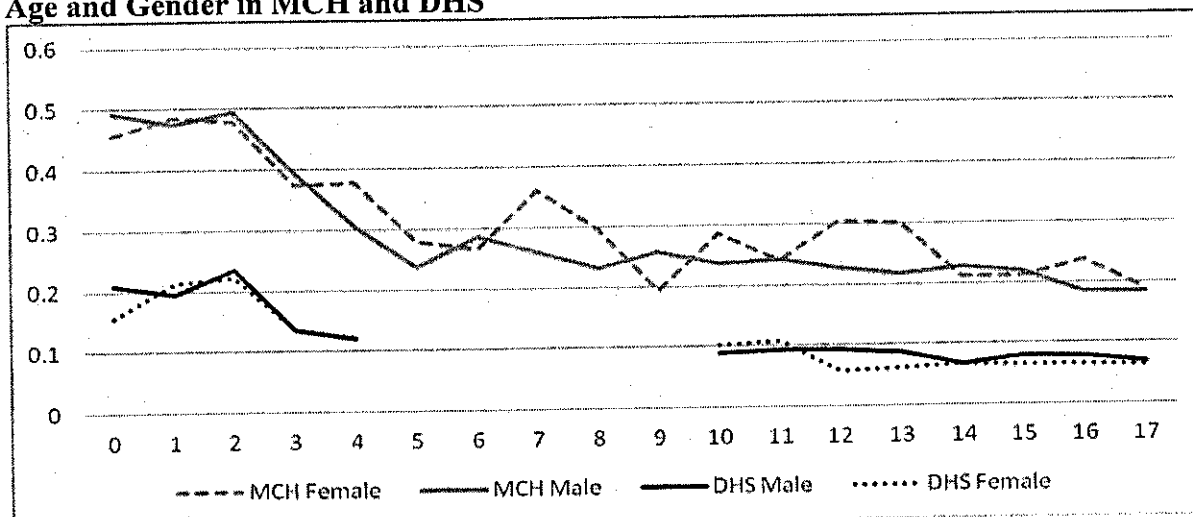

Source: Authors' calculations based on DHS 2008 and MCH 2011 data sets

4.4. Child poverty by Gender and Age

The question of whether deprivation is influenced by gender has captured our attention. For that reason, we tested if there is a significant difference between male and female regarding each relevant dimension separately on both levels. There is no statistical reason to argue that deprivation differs by gender at the national level. Actually, males are more deprived in nutrition whereas female educational deprivation is more apparent. But on the whole, there is no significant difference between them.[12]

Findings on the poorest villages level show that a significant difference was captured only in the education dimension. Females are more deprived than males in access to education.(Figure (7))

Figure 7. Percentage of Children (≤ 17 Years) Deprived of Two or More Dimensions by Age and Gender in MCH and DHS

Source: Authors' calculations based on DHS 2008 and MCH 2011 data sets.

5. Results

In order to use all information available two measurements of being deprived are used, the first where all dimensions except nutrition are considered, this covers about 9748 children, and the second add the nutrition as well, this covers smaller sample with 4445 children.

Three models are reported: the first model considers that the two levels have random intercepts, the second model assumes that only the village level is included and finally, the third model includes only the household level as random intercept. As seen in table 4, when the two levels are included the variance component, that is due to the village level, is very small. The results of the third model, that includes only the household level, confirm the conclusion that the village level can be neglected, as it gives the same results as the first model.

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[12] T-test was applied for testing for significant differences using 10% significance level.

When only the random intercept of the villages is included the results differ, which indicates that when the household level is present, the village level can be excluded.

The interpretation of the results will focus on table 4 (third model) and table 5. While the youngest (below 5) are the most suffering group, the difference between the older groups vanishes when nutrition is included. The deprivation among the youngest reflects the spread of illiterate mothers.

Results show that girls are more deprived, whether the nutrition dimension is considered or not. While neither the employment status of the head of household , nor its gender have an impact on child deprivation, having a minimum education level has a great impact on decreasing the child deprivation in all models.

Crowded or far villages from city have greater impact on increasing child poverty. This can be explained as they suffer more from lack of infrastructure (sanitation and water source) and hence increase the child deprivation. Villages with stable (better) economic status, reflected by increased number of permanent workers,[13] suffer less from child poverty.

Table 4. Determinants of Child Poverty Using Multilevel Mixed Effects Logistic Regression (Excluding Nutrition)*

	Model 1		Model 2		Model 3	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Child characteristics						
Child age <5	4.414 (0.286)	0.0000	.954 (0.067)	0.0000	4.414 (0.286)	0.0000
Child age >5 and <10	-0.599 (0.203)	0.0030	-.0004 (0.068)	0.9960	-.599 (0.203)	0.0030
Gender (girls)	0.599 (0.158)	0.0000	0.139 (0.055)	0.0110	0.599 (0.158)	0.0000
Household members characteristics						
Ever gone to school household head	-2.573 (0.444)	0.0000	-0.408 (0.059)	0.0000	-2.573 (0.444)	0.0000
Gender of head of household (male)	1.234 (0.893)	0.1670	.125 (0.116)	0.2820	1.234 (0.893)	0.1670
Wealth index	-6.870 (0.424)	0.0000	-1.368 (0.046)	0.0000	-6.870 (0.424)	0.0000
Village characteristics						
Distance from Markaz <10 Km	-1.507 (0.432)	0.0000	-0.379 (0.191)	0.0470	-1.507 (0.432)	0.0000
Population density	342.108 (103.544)	0.0010	54.329 (54.367)	0.3180	342.108 (103.544)	0.0010
Number of permanent workers/number of workers	-11.135 (1.672)	0.0000	-2.732 (0.654)	0.0000	-11.135 (1.672)	0.0000
Agriculture Land <3 million square meter	-0.836 (0.731)	0.2410	-0.266 (0.251)	0.2890	-0.836 (0.731)	0.2410
Constant	-3.004 (1.219)	0.0140	0.132 (0.424)	0.7560	-3.004 (1.219)	0.0140

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[13] This variable is computed for the same villages using phase 1 of the survey.

	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Number of observations in different levels						
Number of children	9748		9748		9748	
Number of households	3239		-		3239	
Number of villages				86		86
Estimate of the standard deviation of village random intercept			.791 (.0749)		5.88e-08 (.696)	
Estimate of the standard deviation of household random intercept	.980 (.002)		-		12.62432 (.716)	

Source: calculated by the authors   [1] Non working household head
*Standard errors are in parentheses

Table 5. Determinants of Child Poverty Using Multilevel Mixed Effects Logistic Regression (Including Nutrition)

	Model 1		Model 2		Model 3	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Child characteristics						
Child age <5	4.35 (0.36)	0.0000	1.12 (0.104)	0.0000	4.355 (0.365)	0.0000
Child age >5 and <10	0.25 (0.23)	0.2840	0.13 (0.097)	0.1670	0.268 (0.233)	0.2510
Gender (girls)	0.58 (0.20)	0.0040	0.14 (0.081)	0.0900	0.567 (0.199)	0.0040
Household members characteristics						
Waged worker household head	1.64 (1.19)	0.1670	0.55 (0.183)	0.0030	1.713 (1.180)	0.1470
Non-waged worker household head[1]	0.34 (1.90)	0.8570	0.41 (0.304)	0.1780	0.015 (1.928)	0.9940
Ever gone to school household head	-2.37 (0.55)	0.0000	-0.44 (0.090)	0.000	-2.176 (0.558)	0.0000
Gender of head of household (male)	0.44 (1.46)	0.7650	-0.09 (0.223)	0.7020	0.557 (1.481)	0.7070
Wealth index	-6.39 (0.57)	0.0000	-1.38 (0.069)	0.0000	-6.868 (0.592)	0.0000
Village characteristics						
Distance from Markaz ≤10 Km	-1.46 (0.54)	0.0070	-0.38 (0.257)	0.1400	-1.562 (0.634)	0.0140
Population density	241.48 (122.75)	0.0490	27.08 (73.455)	0.7120	181.318 (149.248)	0.2240
Number of permanent workers/number of workers	-10.86 (2.02)	0.0000	-3.99 (0.895)	0.0000	-11.613 (2.419)	0.0000
Agriculture Land <3 million square meter	-0.69 (0.83)	0.4060	-0.19 (0.350)	0.5860	-0.343 (0.938)	0.7150
Constant	-1.66 (1.45)	0.2510	0.70 (0.579)	0.2250	-1.385 (1.654)	0.4020
Number of observations in different levels						
Number of children		4445		4445		4445
Number of households		1561		-		1561
Number of villages				86		86
Estimate of the standard deviation of village random intercept			1.025 (.109)		1.483 (.405)	
Estimate of the standard deviation of household random intercept	.966 (.005)		-		9.274 (.825)	

6. Conclusions and Recommendations

Poverty in the rural upper area is the highest in Egypt. It is also reflected on the children of rural Upper Egypt as they suffer most of deprivation. The poorest villages (as most of them located in rural Upper Egypt) are the most deprived areas in Egypt. Children of the poorest villages lack the decent housing and decent sanitation, in addition to the minimum educational requirements. Despite these deprivations, it seems that applying good immunization campaign are more successful in closed small areas like villages, as immunization is well spread in these villages.

Special attention should be paid to the gender dimension, as girls suffer more from deprivation. One of the main causes for girls deprivation and as well a challenge in poor villages is still access to schools, which requires more campaigns and awareness in these areas to encourage families to engage their daughters in educational system.

According to the descriptive and the multivariate analyses the determinants of children deprivation can be summarized into two major categories: lack of the decent infrastructure in poorest villages, and the lack of investing in adults represented in education and stable employment, i.e. investing in human capital. This emphasizes the importance of investing in good quality education in particular among females in order to exit the circle of poverty for the next generation of children. Education will provide them with better and more stable job opportunities, and save them from falling into poverty.

On the other hand, there should be more investment at the macro level in these areas. As crowded, far for urbanization villages suffer more from deprivation. Government should start by enhancing the infrastructure and encourage investments in these villages in order to have more stable job opportunities.

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