ASPROWORDA

Working Paper 03/2023

Child fostering and health nutritional outcomes of under-five: Evidence from Cameroon

Armand Mboutchouang K.,
Cédric Foyet K.
&
Cédrick Kalemasi M.

WWW.ASPROWORDA.ORG

Association for Promoting Women in Research and Development in Africa

Child fostering and health nutritional outcomes of under-five: Evidence from Cameroon[1]

Armand Mboutchouang K.
University of Dschang, Cameroon
E-mail: armand.mboutchouang@univ-dschang.org

Cédric Foyet K.
(Corresponding author)
University of Maroua, Cameroon
E-mail: foyet6k@yahoo.fr

Cédrick Kalemasi M.
University of Kinshasa, DR Congo
E-mail: cedrick.kalemasi@unikin.ac.cd

Abstract

The objective of this article is to analyze the effect of child fostering on health nutritional outcomes of under-five children in host households in Cameroon. The data used comes from the recent Cameroon Demographic and Health Survey (DHS-V, 2018). Three anthropometric measures of health and nutritional status are retained: stunting, underweight and wasting. The estimation of a recursive bivariate probit model correcting the endogeneity bias of child fostering shows that fostering improves the health nutritional outcomes of children respectively by 1.14% for the risk of stunting, by 1.97 % for the risk of underweight and 1.28% for the risk of wasting. These results are mainly explained by a better investment in human capital by the parents of the host families. Moreover, robustness analyses show that the participation of women in the labor market in host households is an important transmission channel through which child fostering improves the nutritional health of children. This evidence reinforces the interest of women's empowerment policies to guarantee the improvement of the nutritional health of children, since these are two related sustainable development goals.

Keywords: Child fostering, nutritional health, under-five children, recursive bivariate probit, Cameroon.

*JEL Classification***:** I1, D1

[1] The views expressed in this working paper are those of the authors and do not necessarily represent those of the ASPROWORDA, its Executive Board, or its management.

1. Introduction

For several decades, policy makers and humanitarian organizations have been concerned with the issue of health and nutrition in early childhood. This desire to provide children with better access to nutrition and health was reiterated in 2016 through the Sustainable Development Goals (SDGs), in this case target 2.2 of SDG No.2 which aims to put an end to all forms of child malnutrition by 2030. Despite the progress observed on a global scale, the performance generated by African countries is not reassuring. Cameroon is not on the side-lines of this observation. Indeed, the country has not achieved the Millennium Development Goals (MDGs) concerning the nutrition and health of children under five.[2]For instance, statistics from the Demographic and Health Survey (DHS-V, 2018) indicate that the neonatal mortality rate is 28 deaths per 1,000 live births in Cameroon, while the infant mortality rate is 48 deaths per 1,000 live births, which is still a long way from the objectives that the international community has set itself in terms of children's health. These statistics are of greater concern when it comes to the nutritional health of children. Indeed, the anthropometric indicators of children under five have also not improved significantly since 2010. A still significant proportion of children suffer from stunting, wasting and underweight. About 43.1% of children under five are stunted and 14% of children are severely stunted. Also, emaciation affects 15.1% of children and 2% in the severe form. Finally, underweight affects 33.4% of children under five and 3% with severe underweight.

However, the statistics on the nutritional status of children evaluated at the national level hide social disparities and do not take into account vulnerable children, such as foster children. Indeed, several factors influence the health and nutritional status of children and significant differences can be observed according to the age of the child, his place of residence and his relationship with the head of household in the absence of biological parents (Bledsoe et al., 1988; Castle et al., 1995; Sudre et al., 1990). Biological parents are likely to develop more altruistic behaviours towards their own children compared to those fostered to them (Becker, 1981; Hamilton, 1964a). Thus, foster children can be disadvantaged than biological children in human capital investment, including health (nutrition) and education (Case and Paxson, 2000; Penglase, 2017). Therefore, the phenomenon of child fostering can be a major obstacle to achieving the SDGs in terms of child nutrition and health, although the practice of fostering is

[2] On the one hand, it consisted of halving neonatal mortality and that of children under five to 12 per 1,000 and 25 per 1,000 live births respectively, and on the other hand, reducing the percentage of children under five years old with moderate or severe underweight between 1990 and 2015 (DHS-V, 2018).

mainly explained by the desire of biological parents and the community to offer better living environment for their offspring, including a good health and nutrition status.

Fostering is the act of a biological parent (household) placing one or more children in another extended family household (grandparents, aunts, uncles, cousins and more distant relatives) or sometimes unrelated households (friends, classmates, colleagues and/or acquaintances), in the same locality of residence or not, and for a more or less determined duration (Bledsoe and Isiugo-Abanihe, 1989). The practice of child fostering finds favourable ground in sub-Saharan Africa due to factors such as insufficient educational provision (especially in rural areas), poverty and inequalities of potentials, internal and/or external migration of parents, the still high rate of death of women during childbirth, the strengthening of cultural and family ties (Ainsworth, 1996; Zimmerman, 2003).These factors are amplified in Cameroon due to food insecurity, increasing poverty, crime, violence and armed conflict, which increase the number of Orphans and Children made Vulnerable (OCV). Recent figures show that the number of OCV in Cameroon has increased twice from 258,395 in 2018 to 575,507 in 2022 in the English-speaking regions affected by the Anglophone crisis (OCHA, 2022), and from 152,856 to 357,631 over the same period in the region of the Far North plagued by terrorist attacks of the Islamist sect Boko-Haram (IOM, 2022). Thus, fostering constitutes a social solution in the face of the insufficiency of government assistance towards these vulnerable children (insufficient means to finance reception structures such as orphanages). By way of illustration, data from the Demographic and Health Surveys reveal that the fostering rate of children under five is on the rise in Cameroon, from 5.43% to 8.71% between 2014 and 2018. In addition, the nutrition and health status of fostered children is more worrying than that of biological children. For example, for underweight (chronic and acute malnutrition), the proportions are 36.7% for fostered children against 31.2% for host children.

However, beyond this statistical comparison of children's health and nutritional outcomes, the contribution of this article is twofold. On the one hand, it is a continuation of the work on fostering and the human capital of children in Cameroon pioneered by Eloundou and Shapiro (2005) and Marazyan (2009, 2015). While these works focused on the educational dimension of human capital, this article considers health and nutritional status of children. On the other hand, the article contributes methodologically not only by using recent data, but also by addressing the endogeneity bias due to the fostering of children and which has received little attention in previous works.

The rest of the article is organized as follows: the second section is devoted to the literature review. The third section presents the data and variables used, as well as the estimation strategy. The fourth section presents and discusses the estimation results and the last section concludes.

2. Literature review

2.1. Conceptual framework

Different approaches exist to model household decisions regarding the relationship between fostering and child health outcomes. The most widely used model is the unitary household model of Becker (1981) which states that all family members have the same preferences and these preferences are altruistic in the sense that each member makes his consumption decisions by caring about the well-being of other members[3]. In this model, the production of child health is anchored in a behavioural model of household utility maximization. The analysis assumes that each household consists of a husband, a wife and two children (a girl and a boy). Investment decisions are made solely by the household head, in that he behaves like a benevolent dictator. Therefore, he maximizes the following household utility function:

$$MaxU(X, L, E_a, E_b, \theta, \delta, \varepsilon) \quad (1)$$

This utility function depends on the consumption of each member of the household in goods X and leisure L. Household members $\theta_{1i}, \theta_{2i} \ldots, \theta_{Hi}$, especially parents, also invest in the human capital stock of children (E_a for boys and E_b for girls) repeatedly and over several periods. This investment for a child will depend on the degree of altruism or selfishness of the parents, which is undoubtedly linked to their relationship with the child. Thus, within the household, biological children may receive more attention than foster children. Finally, δ represents some household characteristics and the random term. Moreover, the household maximizes the utility function of equation (1), under the following budget constraint:

$$pX = \lambda(H - L) + R \quad (2)$$

[3]However, the collective household model assumes that each member of the family is characterized by their own preferences and any decision within the household leads to efficient results in the sense of Pareto (Bourguignon and Chiappori, 1994; Chiappori, 1988).

With$p$the price vector of the basket of goods$X$, λrepresents the vector of wages of household members, $H$is the number of hours worked and Rrepresents all non-cash income. The production function for each component ofθ can be specified as follows:

$$\theta = \theta(I, \delta_i, \delta_h, \vartheta) (3)$$

With$I$, the market or non-market inputs (time devoted to health and nutritional status of the child). $\delta_i$represents the individual characteristics of the child (age, sex, relationship of the child to the head of the household), $\delta_h$the characteristics of the household (education of the parents, standard of living of the household), and $\vartheta$the individual, family and unobserved community events that affect the health and nutritional status of the child.

Starting from equation (3), we can deduce a reduced form of the resolution of the household well-being maximization program where the determinants of the child's health and nutritional status result from several characteristics at the rank of which, the characteristics of the child, the household, the parents and the environment, namely:

$$Z_i = f_i(I, \delta_i, \delta_h, \delta_c, \varepsilon) (4)$$

WithZ_i, the z-scores that indicate child health and nutritional outcomes, εa random term associated with child health and nutritional status and unobserved characteristics.

2.2. Empirical review of the effects of fostering on the nutritional health of children

The effects of fostering on the health and nutritional status of children are not clearly established in the literature. Empirical verifications carried out by different works lead to contradictory results. While some authors establish a negative effect of fostering on the health and nutritional status of children (Doom et al., 2015; Case and Paxson, 2004), other studies find a positive effect (Sudre et al., 1990; Bledsoe et Gage, 1987). For example, Case and Paxson (2004), estimating the impact of family structure on investments in the health status of children in the United States, reveal that children living with a foster mother are significantly less likely to have regular visits to the doctor and the dentist, or to benefit from a place for the usual health and medical care. Then, the authors conclude that foster mothers cannot substitute biological mothers of children because they are careless. Similarly, Chung et al. (2001) in the United States

compared fostered children before and after their placement in host families. They found that after placement children were almost twice as likely to have elevated blood lead levels as children in the general population, as well as their siblings who stayed with their original families. In the same vein, a study conducted by Doom et al. (2015) among the general paediatric population between fostered and non-fostered children in the United States found that children fostered abroad presented signs of persistent malnutrition six months after placement and were more likely to score below average on a measure of cognitive development.

Other studies, on the other hand, focus on anthropometric indicators as a measure of the health and nutritional status of children. For example, Hansen et al. (2004) compared the health status of fostered children and those of the same age and sex living in low-income household in the United States to determine whether the health status of children living in foster families is not simply attributable to poverty. They found that fostered children had a greater prevalence of physical, mental and developmental health problems and that short stature was more common among adopted children with average ages of 5.1 years, 11% of whom had short stature. Similarly, Pears and Fisher (2005) compared children aged 3 to 6 who entered, returning, or changed foster care with a community sample of similar low-income children in the United States and shown that 8% of the fostered children were shorter compared to other children living in the community.

These results are also observed in the context of developing countries, particularly in Africa. In a study conducted in West Africa using hospital data, Bledsoe (1987) found a negative relationship between fostering and the nutritional status of children by demonstrating that fostered children are exposed to a higher risk of malnutrition, morbidity and mortality insofar as they have reduced access to various health services and sometimes are excluded from health programs. Moreover, examining the relationships between fostering, feeding practices and access to health services for children in rural Sierra Leone, Bledsoe et al. (1989) revealed that foster children under the age of six were at greater risk of malnutrition than those who were older and grew up with their biological mothers. Furthermore, they highlight similar findings reported in other West African countries where evidence suggests that fostered children at very young ages have a higher likelihood of dying than their unfostered counterparts.

Other research has focused instead on the context in which the study is conducted, indicating that it is the context that determines the host family's motivation to invest in the child's human

capital and ultimately determines the child's health status in general and nutritional health in particular. For example, Bledsoe and Gage (1987) describe how Sierra Leonean children who were asked by infertile women to provide companionship and/or work were treated well and had better nutritional outcomes than those who were sent to relatives because they were from a divorced couple or an extramarital affair. These children, who were socially stigmatised because of the nature of their biological parents' relationship, were given arduous tasks, were often punished by food deprivation, and were at greater risk of clinical malnutrition.

In a study conducted on the relationship between child fostering, health practices and nutritional status on 4683 children under six years of age in rural Swaziland and using population data from the Swaziland National Nutrition Status Survey (1983), Sudre et al. (1990), first find that child fostering increases with age. Second, they find that guardians are older than biological mothers and have lower literacy rates. Third, they show that fostered children are less likely than biological children in the host household to be fully immunised. Fourth, they show that foster children and biological children in the receiving household have similar histories of clinical care attendance. Fifth, they show that after adjusting for socio-demographic factors, the nutritional status of foster children and biological children in the foster household does not differ significantly. In sum, the authors show a high prevalence of child fostering, but do not support the hypothesis of a relationship between fostering and poor child health, as measured by nutritional status.

Investigating the relationship between child fostering and sex ratios on nutritional outcomes of Himba children in Namibia and using anthropometric measures, Sean and Brooke (2017) find that boy children have lower nutritional scores than girl children, and that fostered boy children have lower z-scores and Body Mass Indices (BMIs) than biological boy children. In addition, the authors find that foster girls have lower height z-scores and are more likely to be stunted and underweight than biological girls, noting that these effects extend into adulthood. The authors conclude that gender plays an important role in the nutritional impact of foster children among the Himbas and attribute these differences to different child labour demands.

Many studies have assessed the impact of disability on children's health expenditure, but hardly any have considered the external resource effects of disability in terms of health expenditure between siblings within a household.

3. Data and methodology

3.1. Data source

The data used for this study come from the recent fifth Cameroon Demographic and Health Survey (DHS-V), carried out in 2018 by the National Institute of Statistics (INS) throughout the national territory. The survey collects detailed information on the socioeconomic and demographic characteristics of household members through four main modules: households, men, women and children. This study is interested in the child module which provides detailed information on health and nutritional status of children under five. Questions are answered by either biological or foster mothers aged between 15 and 49 years who take care of the children.

The sample is made up of 9,664 children aged 0 to 5, of whom 8,822 are host children (91.29%) and 842 are foster children (8.71%). However, DHS-V (2018) does not provide data on the households of origin of fostered children and on the characteristics of their biological families, which further limits the analyses.

3.2.Measurement of child fostering and health and nutritional outcomes

Child fostering and the nutritional status of the children are the key variables of the study. Child fostering is also called child transfer or child placement. It is measured through the “kinship of the child with the head of household”. Indeed, it is a variable indicating the relationship of the child with the head of household that is to say whether the child is the son, the daughter or not of the head of household (Case et al., 2000; Bledsoe, 1987). It is a dichotomous variable which takes the value 1 if the child is fostered and 0 otherwise.

The health and nutritional outcomes of children from 0 to 5 years old are measured using anthropometric indicators, including stunting, underweight and wasting (WHO, 1995). Stunting is based on height-for-age z-scores (HAZ), which is a measure of children's body length relative to age. Underweight is based on weight-for-age z-scores (WAZ), which is a measure of children's body mass relative to age. Wasting is based on weight-for-height z-scores (WHZ), which is an indicator of children's body mass relative to body length.

3.3. Estimation strategy

The effect of fostering on the health and nutritional status of children aged 0 to 5 is modelled using a recursive bivariate probit taking into account the endogeneity of fostering due to

unobserved heterogeneities likely to influence these two phenomena. The model is specified as follows:

$$\begin{cases} Z_i^* = X_{1i}\theta_z + \alpha C_i + \varepsilon_{1i} \\ C_i^* = X_{2i}\theta_c + \varepsilon_{2i} \end{cases} \quad (5)$$

Where Z_i^* and C_i^* denote the latent variables of the health and nutritional status of children and fostering respectively. X_{1i} and X_{2i} are a set of child and household-level characteristics used as controls, including age, sex, birth order, the standard of living of the household, the level of education of the mother, access to at least one media by the mother and the place of residence (see table in appendix). θ_z and θ_c are parameters to be estimated. The estimated coefficient α presents the empirical effect of fostering on the health and nutritional status of children. ε_{ji} is the error terms respectively for $j = 1,2$. The characteristics of the error term are presented by the following relations:

$$E(\varepsilon_{1i}|X_{1i}, X_{2i}) = E(\varepsilon_{2i}|X_{1i}, X_{2i}) = 0 \quad (6)$$

$$Var(\varepsilon_{1i}|X_{1i}, X_{2i}) = Var(\varepsilon_{2i}|X_{1i}, X_{2i}) = 0 \quad (7)$$

$$E(\varepsilon_{1i}.\varepsilon_{2i}|X_{1i}, X_{2i}) = \sigma \quad (8)$$

4. Empirical results

4.1. Descriptive statistics

The main variables used in our analysis are described in Table 1 below. Statistics show that on average 43.1% of children in the sample suffer from stunting, 33.4% of children are underweight, and 15.1% of children suffer from wasting. Children are on average 28 months old and 50.6% of them are girls. Households where children live are mainly located in rural area, respectively 55.8% against 44.2% in urban area. Moreover, households are on average in the middle standard of living since the mean value of wealth index is 2.99. Regarding the characteristics of mothers(either biological or foster), they are educated and have completed an average of 4 years of study. Also, 60.3% of mothers have a job or are self-employed;15.5% of mothers have access to at least one media. Descriptive statistics related to the fostering status of children show that 8.7% are fostered.

Table 1. Descriptive statistics

Variables	Mean	Std.Dev.	Min	Max
Children characteristics				
Fosteredchild	0.087	0.282	0	1
HAZ	-1.571	1,790	-5.99	5.85
WAZ	-1.397	1.356	-5.6	4.91
WHZ	0.648	1.377	-4.98	4.99
Stunting	0.431	0.430	0	1
Underweight	0.334	0.492	0	1
Wasting	0.151	0.377	0	1
Sex (girl)	0.506	0.499	0	1
Age (in months)	28.010	17.361	0	59
Birth order	3.453	2.333	1	16
Mother and household characteristics				
Wealth Index	2.996	1.987	1	5
Mother's education (years)	4.063	1.721	0	7
Mother's employment	0.603	0.489	0	1
Mother's access to at least one media	0.155	0.362	0	1
Urban residence	0.442	0.496	0	1

Source: Authors computation from DHS-V (2018).

Prior to the regression analysis, we examine the distributions of the three indicators of health and nutritional status (HAZ, WAZ and WHZ). Figure 1 displays Kernel density plots of each indicator in the whole sample, as well as by the fostering status of children in order to assess the bivariate relationship between child fostering and the health and nutritional outcomes. Therefore, two main results are highlighted.

Firstly, the statistical results of the kernel densities of the HAZ, WAZ and WHZ indicators show that the kernel density of the WHZ indicator is the highest, followed by the kernel density of the WAZ indicator and finally the kernel density of the indicator HAZ. These results confirm the previous descriptive statistics which establish that children mainly suffer from stunting.

Secondly, with regard to the fostering status of children, the Kernel density plots show that the HAZ z-score of biological children is systematically higher than the HAZ z-score of fostered children. Regarding the underweight status, statistics show that the WAZ z-score of biological children is lower than the WAZ z-score of fostered children. Concerning the wasting status, statistics show that the WHZ z-score of biological children is quite similar to the WHZ z-score of fostered children. However, in these analyses, the relationships between children fostering status and their health and nutritional outcomes do not control for any confounding factors. Therefore, we will further control for confounding factors in the regression analysis.

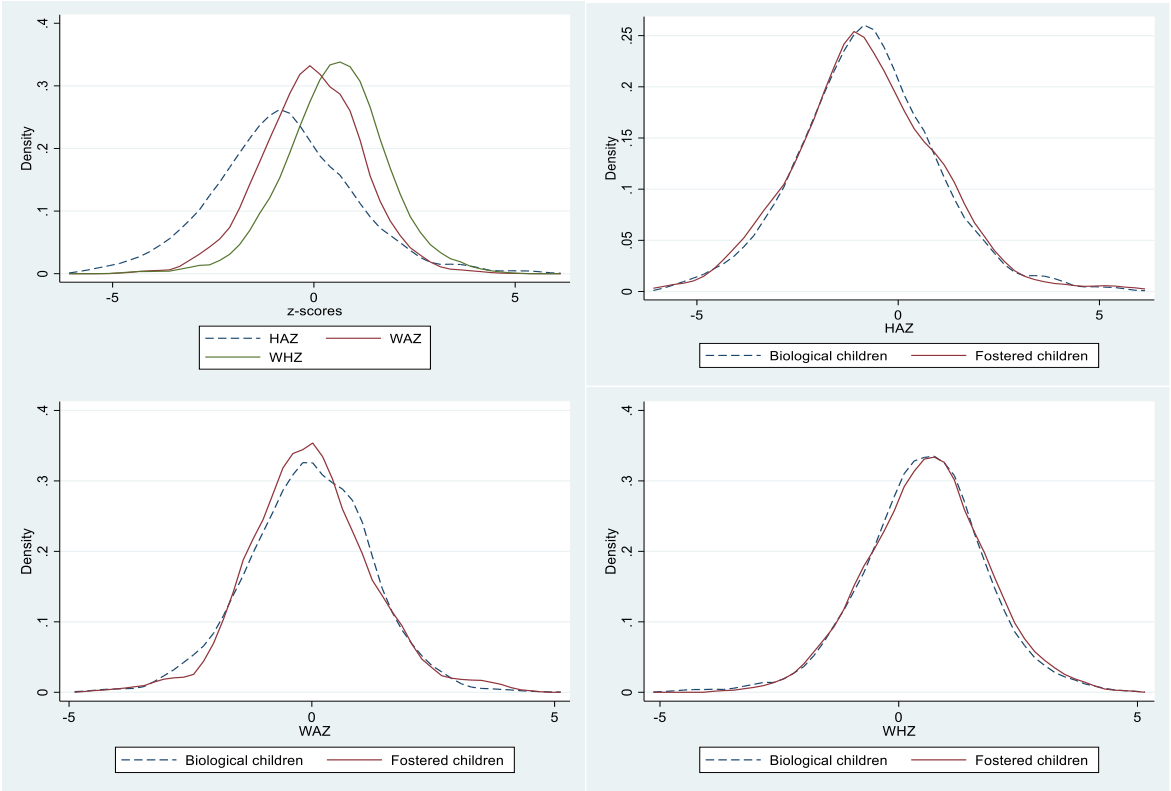


Figure 1. Kernel density of z-scores by child fostering status.
Source: Authors computation from DHS-V (2018).

Furthermore, it is essential to compare the nutritional status indicators of the two groups of children (fostered and biological) in order to assess whether the anthropometric z-scores of the host children are statistically different from that of the fostered children. The results reported in Table 2 below highlight the significant difference that exists between foster children and biological children, for all three indicators of health and nutritional status measured through the z-scores. Indeed, biological children have a better nutritional status than foster children, whether it is stunting, underweight or wasting. These results are confirmed through the proportion comparison tests regarding the binary measure of the nutritional status of children.

Table 2. Mean/proportion comparison tests in children's characteristics

Variables	Overall	Biological Children (1)	Fostered Children (2)	Diff (1) - (2)
HAZ	-1.571 (0.020)	-1.535 (0.025)	-1.627 (0.032)	0.092*** (0.041)
WAZ	-1.387 (0.015)	-1.513 (0.023)	-1.305 (0.019)	0.208*** (0.030)
WHZ	-0.642 (0.014)	-0.575 (0.021)	-0.744 (0.021)	0.169*** (0.028)
Stunting	0.431 (0.005)	0.416 (0.006)	0.445 (0.008)	-0.029*** (0.010)
Underweight	0.333 (0.005)	0.312 (0.006)	0.367 (0.008)	-0.055*** (0.010)
Wasting	0.151 (0.020)	0.139 (0.004)	0.158 (0.006)	-0.019*** (0.041)
N (Obs)	**9,664**	**8,822**	**842**	**9,664**

Source: Authors computation from DHS-V (2018). Notes: Values in parentheses are standard deviations. *******, ****** and ***** indicate significance at 1%, 5% and 10% respectively.

4.2. Effects of child fostering on health and nutritional outcomes

Table 3 shows results of the recursive bivariate probit model estimation in which the dependent variable measures the health and nutritional status of children. Models (1), (2) and (3) report respectively the results for the probability of stunting, the probability of being underweight and the probability of wasting. All models are globally significant at the 1% level thus justifying the relevance of our econometric specification. Moreover, the correlation coefficient (Athrho) is negative and significant for the three models. This result shows the interest of taking into account the endogeneity bias due to child fostering because the two equations of the recursive bivariate probit model are correlated.

Table 3. Effect of fostering on the anthropometric results of children

Variables	Probability of stunting (1)	Probability of being underweight (2)	Probability of wasting (3)
Fosteredchild	-0.0114*** (0.0012)	-0.0197*** (0.0074)	-0.0128*** (0.0047)
Age of the child in months	0.0537 (0.0043)	0.0191 (0.0014)	0.0537 (0.0043)
Age of child squared in months	-0.0007 (0.00007)	-0.0002 (0.00002)	-0.0007 (0.00007)
Female	-0.0133 (0.0085)	-0.0022 (0.0041)	-0.0318 (0.0098)
Birth order	-0.0199*** (0.0027)	-0.0216** (0.0075)	-0.0091** (0.0020)
Wealth Index	-0.6434*** (0.0934)	-0.2363*** (0.0336)	-0.6502*** (0.0959)
Mother's education (years)	-0.0049** (0.0025)	-0.0079*** (0.0017)	-0.0172*** (0.0011)
Access to at least one media	-0.0161 (0.0116)	-0.0075 (0.0061)	-0.0047 (0.0035)
Urban residence	-0.0563*** (0.0122)	-0.0215 (0.0144)	-0.0074** (0.0045)
Constant	0.9002*** (0.2968)	-0.2345 (0.2108)	-0.2811* (0.1365)
N(Obs)	**3,470**	**3,496**	**3,463**
Athrho	-0.0070*** (0.0682)	-0.3263*** (0.2185)	-0.2069*** (0.1262)
LR chi2	2.6706***	0.2165***	1.7228***

Source: Authors computation from DHS-V (2018). Notes: Standard deviations in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Marginal effects are reported regarding significance of each explanatory variable. Our main variable of interest, child fostering status, has a negative and statistically significant effect on the health and nutritional outcomes of children. This effect is consistent for all the three measures used. In other words, the fact that a child is fostered decreases in the risk of stunting by 1.14%; a decrease in the risk of being underweight by 1.97% and a decrease in the risk of wasting by 1.28%. This result would be explained by a better investment in human capital by the children's guardians in foster care, which would have a positive effect on improving the health status of foster children. This result is consistent with other work in sub-Saharan Africa, including Sean Brooke (2017) in Namibia, Simo (2017) in Cameroon, Sudre et al. (1990) in Swaziland and Bledsoe and Gage (1987) in Sierra Leone. A thorough investigation of these results shows that the model is globally significant at the 1% level and the individual significance of the variables is consistent with the theoretical predictions.

Concerning the characteristics of the children, it results from the estimates that additional year of the birth order decreases child malnutrition, respectively by 1.99% for the risk of stunting, 2.16% for the risk of underweight and 0.91% for the risk of wasting. Similar results are reported by Gray (2007); Pal (1999) and Horton (1988). These authors suggest that birth order appears to have a significant effect on quality of life and nutrition, including infant mortality (Gangadharan and Maitra, 2000). However, it can be noted that the expected effect of birth order is ambiguous. Some argue that the first born are often advantaged. Others, on the contrary, maintain that the last children sometimes suffer from being underweight (Arif, 2004). Moreover, some research attests that high-ranking children are malnourished. The relationship between a child's nutritional status and birth order is therefore complex and could depend on household resources, biological and cultural factors (Behrman, 1988; Birdsall, 1991).

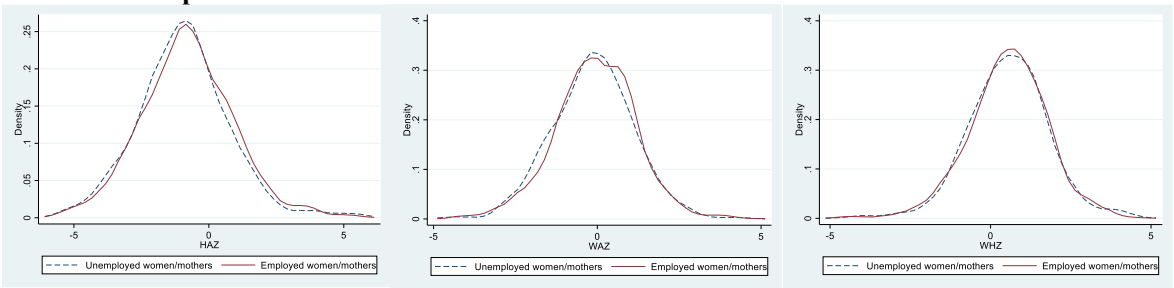
Among the characteristics of the household, the wealth index is correlated with a reduction in the risk of stunting of the order of 64.34%, of the risk of underweight of the order of 23.63% and of the risk of wasting of the order of65.02%.This result corroborates with the work of Mwisha-Kasiwa (2018)in the Democratic Republic of Congo, who find that children living in middle and rich class households are more likely to suffer less from malnutrition than those living in poor households.

With regard to the characteristics of the head of household and the community, the level of education of women is correlated with a decrease of 0.49% in the probability of the risk of stunting, a decrease of 0.79% in the probability of risk of underweight and a 1.72% decrease in probability of risk of wasting. This positive effect of education of women on child health indicators and specifically on nutritional status has often been reported in the literature (Boyle et al., 2006; Waters et al., 2004; Wolfe and Behrman, 1982).By analyzing the area of residence, the probability of being malnourished is lower for children living in rural areas than for children living in urban areas. Indeed, compared to children living in rural areas, the fact that children live in urban areas induces a reduction of 5.63% in the risk of stunting and 0.74% in the risk of wasting. This result confirms the work of Pilon (1995) who highlights a differentiated impact of child fostering according to place of residence in Togo.In the case of Cameroon, this result could be explained by the fact that stunting and wasting are more important in rural than in urban areas.

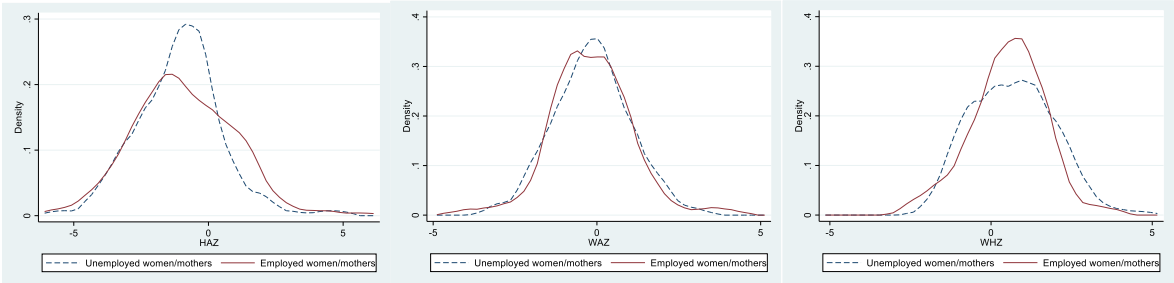
4.3. The role of women's participation in the labor market

To assess the effect of fostering on the health and nutritional status of children under 5, we also focus on the participation of women in the labor market, because few studies have precisely investigated the potential channels transmission of the effects of fostering on the health and nutritional status of children. Therefore, based on the work of Debela et al. (2020) which highlights the impact of women's employment on the nutritional status of children, one can analyse the role of women's participation in the labor market. Indeed, it is possible that the positive effects of being a foster child on the health and nutritional status of children are linked to the high participation of women in the labor market in foster households (Debela et al., 2020).

Panel A. Participation of women in the labor market



Panel B. Fostered children



Panel C. Biological children

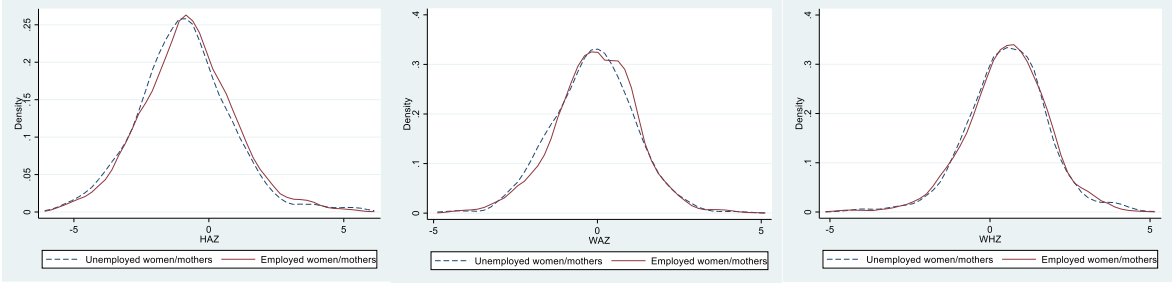


Figure 2. Kernel density of z-scores by child fostering and women/mother employment status.
Source: Authors computation from DHS-V (2018).

Panel A of Figure 2 presents the kernel densities of the HAZ, WAZ and WHZ indicators of women according to women's employment status (working women and non-working women). Thus, several results can be observed. For the HAZ indicator, the results reveal that the HAZ z-score of the children of non-working women is systematically higher than the HAZ z-score of the children of working women. The kernel density diagram of the HAZ indicator of children

of non-working women is significantly different from the kernel density diagram of the HAZ indicator of children of working women. Regarding the WAZ indicator, the results show that the WAZ z-score of the children of non-working women is systematically higher than the WAZ z-score of the children of working women. The kernel density diagram of the WAZ indicator of children of non-working women is significantly different from the kernel density diagram of the WAZ indicator of children of working women. Regarding the WHZ indicator, the results show that the WHZ z-score of the children of non-working women is systematically lower than the WHZ z-score of the children of working women. The kernel density diagram of the WHZ indicator of children of non-working women is significantly different from the kernel density diagram of the WHZ indicator of children of working women.

Panel B of Figure 2 presents the kernel densities of the HAZ, WAZ and WHZ indicators of foster children according to women's employment status (working women and non-working women). To this end, three major results can be identified. For the HAZ indicator, the results show that the HAZ z-score of foster children of non-working women is systematically higher than the HAZ z-score of foster children of working women. The kernel density diagram of the HAZ indicator of foster children of non-working women is significantly different from the kernel density diagram of the HAZ indicator of foster children of working women. Regarding the WAZ indicator, the results show that the WAZ z-score of foster children of non-working women is systematically higher than the WAZ z-score of foster children of working women. The kernel density diagram of the WAZ indicator of foster children of non-working women is significantly different from the kernel density diagram of the WAZ indicator of foster children of working women. Regarding the WHZ indicator, the results show that the WHZ z-score of foster children of non-working women is systematically lower than the WHZ z-score of foster children of working women. The kernel density diagram of the WHZ indicator of foster children of non-working women is significantly different from the kernel density diagram of the WHZ indicator of foster children of working women.

Panel C of Figure 2 presents the kernel densities of the HAZ, WAZ and WHZ indicators of biological children according to women's employment status. Three important results can be noted. About the indicator HAZ, the results reveal that the HAZ z-score of biological children of non-working women is substantially equal to the HAZ z-score of biological children of working women. The kernel density diagram of the HAZ indicator of the biological children of non-working women is not significantly different from the kernel density diagram of the HAZ

indicator of the biological children of working women. The same observation is observed at the level of the WAZ and WHZ indicators where we observe that the WAZ and WHZ z-scores of the biological children of non-working women are substantially equal to the WAZ and WHZ z-scores of the biological children of working women. The kernel density diagram of the WAZ and WHZ indicators of the biological children of non-working women are not significantly different from the kernel density diagram of the WAZ and WHZ indicators of the biological children of working women.

In the specific case of Cameroon, the participation of women in the labor market throughout the year can lead to a situation where, in some households, the health of children and in particular those of foster children have improved due to a better appreciation of the positive association between women's participation in the labor market and the health and nutritional status of children. Thus, the female employment channel is tested by re-estimating the recursive bivariate probit model including an independent variable measuring the interaction between female paid work hours[4]and the foster status of the child. Unlike Kweku and Carmichael (2020), we use a binary measure of women's participation in the Cameroonian labor market rather than simply working hours, because in the DHS V (2018) database, the variable that captures women's participation in the labor market is not continuous. The results (only the marginal effects) are reported in Table 4 below.

Table 4 presents the marginal effects of the results of the recursive bivariate probit estimates of the association that a foster child is malnourished and the participation of women in the labor market. In these estimates, being cared for is significant and negative for stunting, underweight, and wasting. These results suggest that the participation of adult women in the labor market leads to a reduction in the risk of stunting, the risk of underweight and the risk of wasting in children under five.

Moreover, the interaction term between the fact that a child is fostered and that his guardian is engaged in the labor market is significant and negative for stunting, underweight and wasting. This suggests that in foster households, women's participation in the labor market leads to improved health outcomes and nutritional status of foster children. The importance of the interaction term for foster households corroborates the results of Table 3 and suggests that foster

[4]Hours of paid work are retained to decouple child labor from domestic work.

children in foster households are healthier when adult female household members are strongly engaged in the labor market. These results are consistent with the work of Debela et al. (2020) in Tanzania; Rodgers (2011) in Nepal and Chutikul (1986)in Thailand who find a positive value of women's employment on children's nutritional outcomes.

Table 4. Nutritional status and participation of women in employment

Variables	Probability of Stunting (1)	Probability of being Underweight (2)	Probability of Wasting (3)
Fostered child	-0.0114*** (0.0012)	-0.0197*** (0.0074)	-0.0128*** (0.0047)
Age of the child in months	0.0022*** (0.0005)	0.0006 (0.0005)	0.0003** (0.0001)
Age of child squared in months	-0.0003*** (0.00019)	0.00003 (0.0023)	-0.0002*** (0.00002)
Female	-0.1820*** (0.0385)	-0.0650*** (0.0136)	-0.1821*** (0.0385)
Birth order	-0.0070*** (0.0023)	-0.0035 (0.0028)	-0.0015 (0.0011)
Wealth Index	-0.3119*** (0.0566)	-0.0146*** (0.0089)	-0.4440*** (0.0694)
Mother's education (years)	-0.0003*** (0.0014)	-0.0006*** (0.0007)	-0.0008** (0.0004)
Access to at least one media	0.0107** (0.0076)	0.0045 (0.0042)	0.0030 (0.0026)
Urban residence	-0.0085** (0.0070)	-0.0010 (0.0039)	0.0019 (0.0019)
Women's employment	-0.1617*** (0.1109)	-0.1045*** (0.0656)	-0.0444** (0.0266)
Foster children* Women's employment	-0.2290*** (0.0399)	-0.2462** (0.1783)	-0.0940** (0.0751)
Constant	-0.7567*** (0.2360)	-0.7401 (0.2288)	-0.2884 (0.1219)
N(Obs)	**3470**	**3496**	**3463**
Athrho	1.2400** (0.4726)	-0.5723*** (0.4828)	-0.5044*** (0.3398)
LR chi2	6.8830***	1.4784***	2.1284***

Source: Authors computation from DHS-V (2018). Notes: Standard deviations in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

5. Conclusion

This research consisted of examining how the child's relationship to the head of household affects his or her health and nutritional status. The data used come from the fifth Demographic and Health Survey (DHS V, 2018). Three anthropometric measures of health and nutritional status of children are retained: stunting, underweight and wasting. Estimation of a recursive bivariate probit model correcting the endogeneity bias of child fostering shows that fostering

improves the nutritional status of children respectively by 1.14% for the risk of stunting, by 1.97 % for the risk of underweight and 1.28% for the risk of wasting.

These results can be explained by a better investment in human capital by the parents of the foster families. Moreover, the robustness analyses show that the participation of women in the labor market in foster families constitutes an important channel of transmission. The results are consistent with the literature and support the work of Debela et al. (2020) in rural areas for the case of Tanzania; Rodgers (2011) for Nepal; Glick and Sahn(1998) for Guinea and Chutikul (1986) for Thailand. This evidence reinforces the interest of women's empowerment policies to guarantee the improvement of the nutritional health of children, since these are two very interrelated development objectives.

However, our analyses remain limited in the sense that we do not have information on the families of origin of the foster children. It would therefore be wise for future research to make comparison analyses of foster children to their biological siblings who are not fostered. Also, to consider the possibility of having the data on the characteristics of the parents of origin. These avenues can be taken into account in the collection of data on the issue in developing countries, particularly in Africa.

References

Ainsworth M. (1996), "Economic aspects of child fostering in Côte d'Ivoire". Research in Population Economics, vol 8, pp.25-62.

Arif, GM (2004), "Child health and poverty in Pakistan," The Pakistan Development Review, 211–238. 197.

Becker, GS (1981a), "A Treatise on the Family". Cambridge, MA: Harvard University Press.

Becker, GS (1981b), "Altruism in the Family and Selfishness in the Market Place". Economica, 48 (189), 1.https://doi.org/10.2307/2552939.

Behrman, JR, and AB Deolalikar (1988), "Health and nutrition," Handbook of development economics, 1, 631–711.

Birdsall, N.(1991),"Birth order effects and time allocation". In Research in Population Economics. A research annual, Ed. TP Schultz, Vol 7, pp. 191-213, JAI Press Inc. Greenwich, Connecticut and London.

Bledsoe, C., and U. Isiugo-Abanihe (1989), "Strategies of child-fosterage among Mende grannies in Sierra Leone," Reproduction and social organization in sub-Saharan Africa, 442–474.

Bledsoe, C., and Gage, A. (1987),"Child fosterage and child mortality in sub-Saharan Africa: some preliminary questions and answers". Paper presented at the IUSSP Seminar of Mortality and Society in Sub-Saharan Africa. Yaounde, Cameroon.

Bledsoe, C., Ewbank, D., Isiugo-Abanihe, U. (1988),"The effect of child fostering on feeding practices and access to health services in rural Sierra Leone".*Social Science & Medicine*, Flight. 27, No. 6, p. 627-636.

Boyle, M., Yvonne R., Katholiki, G., Dana, S., Sungjin H., Walter O., Patricia H., and P. Rao-Melacini(2006), "The Influence of Economic Development Level, Household Wealthand Maternal Education on Child Healthin the Developing World,"*Social Science &medicine*,63 (8), 2242–54.

Case, A., C. Paxson, and J. Ableidinger (2004), "Orphans in Africa: Parental death, poverty, and school enrollment," Demography, 41(3), 483–508.

Case, A., and Paxson, C. (2000), "Mothers and others: who invests in children's health?" National Bureau of Economic Research Working Paper 7691.

Castle, SE (1995), "Child fostering and children's nutritional outcomes in rural Mali: the role of female status in directing child transfers," Social Science & Medicine, 40(5), 679–693.

Chung, EK, D. Webb, S. Clampet-Lundquist, and C. Campbell (2001), "A comparison of elevated blood lead levels among children living in foster care, their siblings, and the general population," Pediatrics, 107(5), e81–e81.

Chutikul, S. (1986), "Malnourished Children: An Economic Approach to the Causes and Consequences in Rural Thailand," Papers of the East West Population Institute, No. 102, Honolulu, Hawaii: East West Center.

Darko, Christian Kweku, and Fiona Carmichael (2020),"Education of biological and fostered children in Ghana: The influence of relationships with the household head and household structure". Journal of International Development 32 (4): 487-504.

Debela, B., Gehrke, E and Qaim, M. (2020) "Links between maternal employment andchild nutrition in rural Tanzania", American Journal of Agricultural Economics. Vol:103(3), pp:812–830; doi:10.1111/ajae.12113.

Doom, JR, MK Georgieff, and MR Gunnar (2015), "Institutional care and iron deficiency increase ADHD symptomology and lower IQ 2.5–5 years post-adoption," Developmental science, 18(3), 484–494.

Eloundou-Enyegue, P., and D. Shapiro (2005), "Child care and leveling of educational inequalities in Cameroon, 1960-1995," Cahiers Québécois de démographie, 34(1), 47–75.

Gangadharan, L., and P. Maitra (2000), "Does child mortality reflect gender bias? Evidence from Pakistan," Indian Economic Review, 113–131.

Glick, P., and D. Sahn (1998), "Maternal labor supply and child nutrition in West Africa", *Oxford Bulletin of Economics and Statistics*, 60(3), 325-355.

Grira, H. (2007), "Determinants of Nutritional Status in Matlab: An Empirical Analysis." Center for Economics of the Sorbonne, CES Working Paper n° 39.

Hamilton WD (1964) “The genetical evolution of social biology”, Journal of Theoretical Biology, vol 7. P.1–16.
Hansen, RL, FL Mawjee, K. Barton, MB Metcalf, and NR Joye (2004), “Comparing the health status of low-income children in and out of foster care,” Child welfare, 83(4), 367.
Horton, S. (1988), “Birth order and child nutritional status: evidence from the Philippines,” Economic Development and Cultural Change, 36(2), 341–354.
Marazyan, K. (2009), “Assessing the Effect of Foster-Children Supply on biological children education demand: some evidence from Cameroon.”
Marazyan, K. (2015a), “Foster children's educational outcomes when child fostering is motivated by norms: The case of Cameroon,” Journal of Comparative Family Studies, 46(1), 85–103.
Mwisha-Kasiwa, J. (2018), “Household Economic Well-being and Child Health in the Democratic Republic of Congo”, *Journal of African Development*, 20(1), 48-58.
Pal, S. (1999), “An analysis of childhood malnutrition in rural India: role of gender, income and other household characteristics,” World Development, 27(7), 1151–1171.
Pears, K., and PA Fisher (2005), “Developmental, cognitive, and neuropsychological functioning in preschool-aged foster children: Associations with prior maltreatment and placement history,” Journal of Developmental & Behavioral Pediatrics, 26(2), 112– 122.
Penglase (2017). “Child Fostering and Intrahousehold Inequality”. Department of Economics, Boston College. NBER Working Papers.
Pilon, M. (1995), “Determinants of the schooling of children aged 6 to 14 in Togo in 1981: contributions and limits of census data,” Cahiers des sciences sociales, 31(3), 697–718.
Powers, J.M., and G.R. Buchanan (2014), “Iron deficiency anemia in toddlers to teens: How to manage when prevention fails,” *Contemporary Pediatrics*, 31(5), 12–18.
Rogers, V.(2011). “Maternal Employment and Child Health: Global Issues and Policy Solutions”. Edward Elgar Publishing.
Sean P., and Brooke, AS (2017), “Child fosterage and sex-biased nutritional outcomes among Namibian pastoralists”. American Journal of Human Biology. Department of Anthropology, University of California, Los Angeles, Los Angeles, California, 90095-1553.
Simo, F. A. (2017), “Child disability and siblings' healthcare expenditures in a context of child fostering”. Social Science & Medicine, 182, 89-96.
Sudre, P., M. Serdula, N. Binkin, N. Staehling, and M. Kramer (1990), “Child fostering, health and nutritional status: the experience of Swaziland,” Ecology of food and nutrition, 24(3), 181–188.
Waters, H., Saadah, F., Surbakti, S. and P. Heywood (2004), “Weight-for-Age Malnutrition in Indonesian Children, 1992–1999,” *International Journal of Epidemiology*, 33 (3), 58995.
Wolfe, B. and J. Behrman (1982), “Determinants of Child Mortality, Health, and Nutrition in a Developing Country,” Journal of Development Economics, 11 (2), 163–93.
Zimmerman F. (2003) “Cinderella goes to school: The effects of child fostering on school enrollment in South Africa”. The Journal of Human Resources, vol 38, No.3, p. 557–590.

Appendix

Table. Definition and description of variables

Variables	Definition/Measurement
Individual characteristics of the child	
Child's age	Child's age in months
Child's gender	1 if the child is a girl and 0 if the child is a boy
Foster Children	1 if the child is fostered and 0 otherwise
Birth order	Continuous variable
height-for-age (HAZ) z-score	Continuous variable
weight-for-age (WAZ) z-score	Continuous variable
weight-for-height (WHZ) z-score	Continuous variable
Body Mass Index (BMI)	Continuous variable
Stunting	1 if the child has a HAZ score less than -2 standard deviation below the median of the reference population and 0 otherwise
Underweight	1 if the child has a WAZ score less than -2 standard deviation below the median of the reference population and 0 otherwise
Emancipation	1 if the child has a WHZ score less than -2 standard deviation below the median of the reference population and 0 otherwise
Household and mother characteristics	
Household Wealth Index	Discrete variable (1. Poor to 5. Rich)
Education of the mother	Number of years of study
Access to at least one media by the mother	1 if the woman has access to at least one medium and 0 otherwise
Women's employment	1 if the woman participates in the labor market and 0 otherwise
Place of residence	1 if the area is urban and 0 otherwise

Source: Authors' computation from DHS-V (2018).