Determinants of Child Malnutrition in Mauritania

Yahya Abou Ly

Research Paper 391

AFRICAN ECONOMIC RESEARCH CONSORTIUM
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

Bringing Rigour and Evidence to Economic Policy Making in Africa

Determinants of Child Malnutrition in Mauritania

By

Yahya Abou Ly
Cheikh Anta Diop University
Dakar, Senegal

AERC Research Paper 391
African Economic Research Consortium, Nairobi
January 2020

THIS RESEARCH STUDY was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are those of the author, however, and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 - City Square
Nairobi 00200, Kenya

ISBN 978-9966-61-084-3

Contents

List of tables

Abstract

The empirical context of this research is in an environment where malnutrition is a real public health concern. The objective of this study was to identify the determinants of the nutritional state of children under the age of five years in Mauritania. Using data obtained from multiple indicators cluster surveys (MICS) in Mauritania in 2007 and 2015, we undertook fixed-effects clusters techniques to control for unobserved heterogeneity. The empirical results demonstrate that the age and sex of a child, level of education of the mother, the standards of living of the household, the area of residence, the availability and use of health care services and access to drinking water are all important factors for the good health of children in Mauritania. These findings suggests improvements in nutritional health, for example, by education of girls until completion of secondary school; an improvement in the conditions of households that are headed by women and an expansion in the coverage rate of multi-purpose health centres.

Key words: State of health, fixed effect clusters, anthropometric measurement, size-for-age, z-score.

JEL codes: I12, I21, C26, J13

Résumé

Le contexte empirique de cette recherche se situe dans un environnement où la malnutrition constitue une réelle préoccupation de santé publique. L'objectif de cette recherche est d'identifier les déterminants de l'état nutritionnel des enfants de moins de cinq ans en Mauritanie. À partir des données des enquêtes MICS pour la Mauritanie de 2007 et de 2015, nous avons procédé à des techniques à effets-fixes clusters pour contrôler l'hétérogénéité inobservable. Les résultats empiriques ont pu montrer que l'âge et le sexe de l'enfant, le niveau d'éducation de la mère, le niveau de vie du ménage, le milieu de résidence, la disponibilité ainsi que l'utilisation des services de soins de santé sont autant des facteurs importants pour la bonne santé des enfants en Mauritanie. Ces résultats suggèrent que l'amélioration de la santé nutritionnelle pourrait passer, par exemple, par une scolarisation des filles jusqu'à la fin du cycle secondaire ; une amélioration du sort des ménages dirigés par des femmes et un élargissement du taux de couverture des centres de santés polyvalents.

Mots clés : état de santé, effets-fixes-clusters, mesures anthropométriques, taille pour âge, z-score.

Codes JEL: I12, I21, C26, J13

1. Introduction

The fight against poverty is key in ensuring the economic and social development of a country. Its analysis has been the subject of several debates and controversies in terms of the extent of the problem and its conceptualization. The well-being of individuals is necessary in order to ensure sustainable development. This vision has been widely shared in the Millennium Development Goals (MDGs) and in the sustainable development objectives. This study is formulated within that framework and attempts to explore one of the non-financial aspects of well-being, namely human capacity and, more specifically, health.

Statement of the problem

Schultz (1961) and Becker (1965) were among the first people to introduce the concept of human capital in economic theory. This concept is understood as the amount of productivity and general well-being available to an individual in a given society. It has an education component (initial and continuous training, and a set of aptitudes, and a health component (Mushkin, 1962). In regard to economic research that has paid particular attention to the long-term effects of the living conditions of children, Grossman (1972) also pays particular attention to investment decisions relating to the health of adults. In regard to infants, empirical studies have highlighted the effect of socioeconomic, demographic and environmental factors on the health status of children (Sahn, 1990; Handa, 1999; Tharakan and Suchindran, 1999). Literature has often associated the result of a low supply and a low level of accessibility to food resources to a phenomenon of human incapacity in regard to sufficient nutrition. This situation of nutritional imbalance leads to malnutrition.

Malnutrition is the most common illness among the children under the age of 5 years. It is also common in developing countries and has a significant impact in terms of delayed physical and cognitive development, morbidity, mortality, and in terms of scholarly performance and productivity (Sahn and Alderman, 1988). The World Health Organization (WHO) defines malnourishment as a pathological state that is a result of deficiency or excess in relative or absolute terms in regard to various essential nutrients. This definition allows us to distinguish between three forms of malnutrition: malnutrition by excess (overeating); undernourishment (eating insufficiently); and nutritional deficiency (eating poorly or in an unbalanced manner) generally

considered as one of the most alarming forms in several developing countries. Food deficiency is caused by a poor diet and inadequate health care. It is characterized by anthropometric (height and weight of the infant), chemical and biological symptoms.

Consequently, undernourishment is a global problem that affects most regions. In absolute terms, 243.2 million people in the world did not have adequate dietary energy intake (FAO, 2017). The number of people suffering from undernourishment has sharply increased since 2014, increasing from 775 million in 2014 to 815 million in 2016 (FAO, 2017). Undernourishment is much more pronounced in Africa than in other regions of the world. Indeed, its occurrence is 20% in Africa whereas it is 11.7% in Asia and 2.5% in North America and Europe (FAO, 2017). Sub-Saharan Africa also remains the region that is most affected by this phenomenon with a prevalence rate of 22.7% in 2016. Global statistics on nutrition show that the problem of malnutrition remains unresolved and the various forms of malnutrition are still alarming. The Nutrition Global Report (FAO, 2017) indicates that in 2016 a total of 155 million children suffered from stunting (22.9%,), 52 million were emaciated (7.7%), two billion suffered from deficiency in terms of essential micronutrients, such as iron and vitamin A, and twobillion infants were overweight (6%).

In Mauritania, problems related to malnutrition are equally worrisome. Pregnant and nursing women and children under the age of five years are the most affected by this phenomenon (WFP, 2015). Nutritional effects are evident at several levels, especially in children under the age of five. The report on the cost of hunger in Mauritania (CEA, 2014) shows that:

- The number of children suffering from malnutrition in terms of being underweight has increased;
- 43% of the active population suffers from stunted growth during their childhood;
- Mauritania lost 13.3% of its GDP due to the cumulative effects of stunted growth on productivity;
- 4.5% of infant mortality in Mauritania is related to undernourishment;
- Children affected by stunted growth achieve 2.4 school years less than those who did not suffer from malnutrition.

In light of this scourge affecting children, public authorities have taken initiative by adopting in 2005, the National Nutrition Development Plan (PNDN). This programme includes the Integrated Management of Acute Malnutrition (PECIMA) and the fight against deficiency in micronutrients as well as operations for the monitoring of children. In regard to the National Health Development Plan (PNDS) 2012–2020, the major objective is to reduce among other things:

- The maternal mortality rate at 317 (for 100,000 live births) in 2020;
- Child mortality at 32.6 (for 1000 live births) in 2020;
- The percentage of management of severe malnutrition at 80%.

However, even though there is a demonstrated willingness by authorities to fight against this scourge, the level of malnutrition remains worrisome given that the MDGs in regard to nutrition have not been achieved. The infant mortality rate was estimated at 115 per 1,000 in 2013 by the General Census of Population and Housing (RGPH) whereas the MDGs had set a target of 45 for 1,000 in 2015. The ratio of maternal mortality is still one of the highest in the region with 582 per 1,000 live births in 2013 (RGPH), way above the target which was 232 for 1,000. The evaluation document by United Nations Development Programme (UNDP, 2015) in Mauritania clearly indicated that the objectives towards a reduction in infant mortality in children under five (MDG3) and improvement of maternal health (MDG4) were beyond reach. Beyond this health crisis that is being experienced by children, the country is also experiencing a problem related to food security. The follow-up survey on food security in Mauritania (FSMS) 2015 undertaken by the Commission on Food Security (SCA) and the World Food Programme (WFP) demonstrated that 23.8% of Mauritanian households were facing food insecurity (WFP, 2015). This rate is relatively high when compared to that in 2014 which was at 18.5% and it is the highest rate observed during a post-harvest period.

An increasing number of theoretical as well as empirical studies have taken an interest in the determinants of the health status of children. However, research on this phenomenon in Mauritania seems non-existent. This study intends not only to fill this gap, but also to give policy guidelines so as to effectively combat child malnutrition. The determinants of malnutrition are multidimensional; they cover socio-demographic, economic and environmental factors. Several empirical studies have been undertaken to determine the factors contributing to malnutrition of children under five in developing countries. These studies have highlighted the role of the education of the mother on the health of the child (Boccanfuso and Bruce, 2010) and the occupation of the mother (Ukwuani and Suchindran, 2003). The standard of living of the household is also seen as an important element (Ambapour and Hylod, 2008). Morrisson and Linskens (2000), highlight the effect of access to media on child health. Lachaud (2001) and Sahn (1994), identified determinants of the health status of children by distinguishing between their place of residence. Furthermore, Wagstaff et al (2003) and Mussa (2014) suggest a decomposition of the malnutrition gap over several periods or according to the place of residence (rural or urban).

In regard to this problem that is specific to Mauritania, it is important to re-examine the nutritional state of children under the age of five by focusing on real and specific factors. The understanding of real and specific factors was the objective of this study so as to propose policy guidelines to effectively combat this scourge. It is with this

aim that the study also attempted to respond to the following question: What are the factors contributing to the nutritional status of children under the age of five in Mauritania?

Objectives

The main objective of this study was to analyse the dynamics of nutritional status of children under the age of five years in Mauritania. The specific objectives were to:

- Examine the effect of socio-economic factors on the nutritional status of children under the age of five years in Mauritania;
- Examine the effect of socio-demographic factors on the nutritional status of children under the age of five years in Mauritania;
- Suggest policy recommandations.

The rest of the paper is organized as follows. Section two provides a review of literature on nutritional status of children. Section three discusses the methodology used in this study, the measurement of the health status of children, data sources and definition of variables. The results and discussion are presented in section four and in section five concludes and gives policy recommendations.

2. Literature review

A problem with health at a young age could have consequences that are experienced ensuring adulthood (Appaix, 2003). Assuring child health is essential in order to guarantee their development. Several factors contribute to the improvement of children's health, among them: characteristics specific to the child, parents, household, environment and community. In this sub-section, we consider empirical studies related to the nutrition of children under the age of five years old.

Individual characteristics of the child

Age and gender of the child

Horton (1988) defends the idea that age has a capital importance on the health of the child in question. As the age of a child increases, he observes a continued deterioration in the health status of children in developing countries because of cumulative effects of insufficiency in nutrient intake. In other words, health that is compromised at a young age could subsequently lead to negative consequences on the health of the child (Appaix, 2003). The effect of age on the nutritional health of the child could be taken into account in several ways: either through the use of logical classification through consecutive intervals (Ambapour and Hylod, 2008), or through adopting the quadratic form (Shariff and Ahn, 1995; Olaniyan, 2002).

In relation to sex, Lefebvre (2006) demonstrates that the sex of an infant has marked and widespread effects on the behaviour of parents. Studies undertaken on malnutrition in India (Pal, 1999; Gangadharan and Maitra, 2000) indicate that parents show preference for infants of the male sex. As a result, malnutrition is widespread in girls. Such behaviour is related to certain customs and beliefs which give more privileges to boys from birth (Behrman, 1988). Boys are generally considered by their fathers as future managers who will eventually take care of their families. Contrary to what one would believe, girls are almost always less privileged. FAO (2005) established that girls and women eat fewer quality proteins (meat, chicken and eggs) than do boys or men, which could form the basis of their troubles in terms of iron deficiency for girls and women.

Birth rank of the child

The empirical literature have shown that birth rank has an impact on the nutritional health of a child (Horton, 1988; Grira, 2007). Authors such as Mudubu (1996) and Rakotondrabe (1996) have demonstrated that first-born children present a higher risk of suffering from malnutrition because they are born when their mothers are still immature, are not aware of how to care for newborn babies and misunderstand various nutritional requirements for children. Malnutrition could also result from successive pregnancies that could lead to fatigue and weakening of the mother, which would render her unable to properly care for her children. However, the expected effect of the birth ranking on child health is ambiguous (Ambapour and Hylod, 2008) and often complex (Behrman, 1988).

Interval of births

Literature also shows that a short interval between births can cause a physiological impairment in the mother, such that the child may have a small weight at birth. The more closely spaced the births, the lower the breast milk quality particularly due to the effect of physical exhaustion on the mother (Ambapour and Hylod, 2008). The same applies for the spacing interval, which not only influences malnutrition, but also child mortality, through the syndrome of maternal exhaustion (Mudubu, 1996).

Characteristics of the mother in nutritional terms

Age and family situation of the mother

Empirical literature demonstrates that age has a significant effect on the nutritional health of a child. In other words, the age could have a positive or negative effect on the nutritional state of the child. In terms of the positive effects, Latham (2001) considers that young women who are too immature to feed their children are also less experienced in terms of providing them with care. More mature women are assumed to have more experience in terms of child health care. However, at the physiological level, the negative effect could be explained by the fact that aged women often suffer from the exhaustion syndrome, in other words, they produce less milk than would assure normal breastfeeding for the child in terms of quantity and quality (Latham, 2001). Rakotondrabé (1996) adds that, under such conditions, the infant runs a high risk of dehydration which would in the long-run lead to troubles caused by nutritional deficiencies.

Parents' education

Behrman and Déolalikar (1988) distinguish between five channels through which parents' education has an impact on the growth of a child. First, education has a direct impact on the acquisition of knowledge in terms of health and hygiene. Second,

it increases general competencies in terms of reading and consequently, it allows for a better understanding of instructions given by caregivers in order to manage illnesses better. Third, education increases the probability of finding employment, increasing total household income in order to improve the nutritional health of the child. Fourth, education increases the opportunity cost of working hours and thus reduces the time set aside for child care. Finally, parental education could affect the preferences of parents in a systematic manner, notably in their choice of the number of children they will have.

Strauss (1990) undertook a study on child nutrition in rural Côte d'Ivoire. He introduced parents' education as an indicator of human capital and a variable that brings together economic capital and the family. He concluded that the human capital of the parents influences the survival and the development of the child. Furthermore, Glewwe (1999) demonstrated that only the knowledge of health care by the mother stands as a crucial element in the health of infants in Morocco. A study similar to that of Glewwe (1999) undertaken by Thomas et al (1991) in Brazil, shows that the education of the mother has a significant impact on the size of children in rural and urban areas in north-east Brazil. Through studies carried out in Benin, Ahovey and Vodounou (2004) indicated that the education of the mother is a factor that strongly contributes to a reduction in the risk of stunting. They found that an increase in the number of years of education of the mother by a year reduced by 0.34 points the eventual risk of stunted growth. In a study carried out in Senegal, Badji (2006) show that the higher the level of education of the mother, the more the probability of the infant achieving their growth potential rises.

Breastfeeding and complementary foods

According to the United Nations Children's Fund Declaration (Unicef, 1998), each child has a right to breast milk from the moment of birth. The mother should breastfeed her child even before the umbilical cord is cut. Breast milk comes with several advantages, notably:

- Creating a bond through the first contact between mother and baby;
- Intake of colostrum which contains all the nutritive elements (water, protein, carbohydrates, lipids and vitamins) which the new born requires;
- Facilitation of the expulsion of the placenta;
- Lactogenesis.

This is why breast milk is the best form of food available for a baby. It protects the baby against diarrhoea, coughs and pneumonia. Morrisson and Linskens (2000) demonstrated that the effect of breast milk on the health status of the child depends

on the region. In rural areas, the positive effects dominate, whereas the effect is in the inverse in towns. According to these authors, it is in rural areas that hygiene standards are low and most parents are very poor, thus the importance of breast milk in ensuring protection of the new born.

Socioeconomic characteristics of the household

Inasmuch as malnutrition can be explained by a food deficit, it could also be due to the absence of healthy food, notably in terms of quantity and quality. According to Gibson (2000), the income of parents has a significant effect on the health of children. Lachaud (2001) showed the existence of a direct correlation between an increase in per capita expenditure and a reduction in the rate of malnutrition in Burkina Faso. Consequently, Badji (2006) showed that the income had a positive and significant effect on the health of children in Senegal. From the indicator of stunted growth (size-for-age), Ukwuani and Suchindran (2003) examined the relationship between the nutritional state of children and the occupation of women in Nigeria. In their studies, they arrived at results that the level of wasting of infants increases when their mothers do not go to work with the children and that a short period of breastfeeding also increases the risk of wasting in children.

Characteristics of the environment of the community

The environment in which a child grows up is fundamental in terms of ensuring their growth. Most demographic and health surveys (DHS) or multiple indicator cluster surveys (MICS) show that malnutrition is higher in children from rural areas than in those from urban areas. This difference occurs because one often observes an unequal distribution of infrastructure between rural and urban areas. Children from the rural areas are at a disadvantage when compared to those from urban areas (Ambapour and Hylod, 2008). On the basis of a comparative study on the nutritional state before and after the devaluation of the FCFA in Senegal in 1994, Badji and Boccanfuso (2006) demonstrated that the place of residence significantly explains the nutritional health of Senegalese children aged less than five.

Empirical literature also shows that certain researchers have sought to explain the determinants of malnutrition in infants based on a comparative analysis of two zones or different periods (Wagstaff et al, 2003). Indeed, Wagstaff et al (2003) decomposed the inequality gap in the Vietnamese health sector between 1993 and 1998 using a concentration index. With data from the MICS of 2006, they used the Nopo[1] method to decompose the malnutrition gap between the rural and urban areas. Boccanfuso and Bruce (2010) proposed the Yun (2005a, b) approach to decompose the gap between the nutritional state of Guinean children observed between 1999 and 2005 in detailed effects of characteristics as well as that of the coefficients of the characteristics. According to Adewara and Visser (2011), other communal factors could affect the health of a child such as access to drinking water.

Use of health care services

Literature has also shown that the interval between births plays an important role in the health of the child. Morrisson and Linskens (2000) undertook a comparative study on the factors contributing to malnutrition in children aged below five in 20 years in African countries[2]. They thus demonstrated that mothers raising two or three children at the same time provide less health care to their children. To this effect, repeated childbirth weakens the mother and especially if the births are closely spaced. A short interval between births reduces the quality of milk due to the physical fatigue experienced by the mother. Mariara et al (2008) also highlight that a reduction in the number of births through the use of contraceptives is correlated to the size of children in Kenya. According to them, an increase by 1% in the use of contraceptives eventually leads to an increase in the size of the child by 0.58 z score size-for-age. In the same manner, Ssewanyana (2003) demonstrated that resorting to the use of contraceptives reduces fertility to allow the mother more time to attend to breastfeeding her baby. Grira (2007) also showed that a reduction in the interval between births worsens the health status of the child. According to the researcher, parents could decide to limit the number of children to ensure they only have children of good quality. According to Thomas et al (1996), availability and access to health care services improve the nutritional health of the child.

Numerous theoretical and empirical studies have tried to address the understanding of the health status of children. In this section, we have undertaken an empirical and methodological review of the nutritional health of children. From the empirical point of view, it is evident that the nutritional status of children depends on several factors such as individual characteristics of the child; parents' characteristics, notably the mother; household characteristics; characteristics linked to the environment or the community; and characteristics linked to the availability and use of health care services. From a methodological point of view, the nutritional state is notably measured using anthropometric measures, stunted growth, wasting and being underweight. In regard to this approach, new researchers have proposed analysis based on decomposition, inequality indexes, concentration indexes and cluster analyses, in order to better understand the nature of the nutritional health of children under the age of five. The understanding of this latest methodological tool is the focus of the following section.

3. Methodology

This section begins with a description of the theoretical approach adopted in this analysis in order to explore the factors influencing child health in Mauritania. It is followed by a description of the measurement indicators of child health and finally, by a presentation of the source and the quality of data and a definition of variables.

Theoretical Model

The theoretical basis of our study is the utility function of the health and nutrition of each household member, the goods acquired and the production by the household (Schultz, 1984). We consider a model of household well-being Z, which depends on the utility function of each member (Maitra and Ray, 2001).

$$Z = Z(U_i) \tag{1}$$

Where U_i depends on the consumption of goods and services of each household X, of hobbies L and the vector of household characteristics (education, health, nutrition, standard of living, etc.). Finally, we focus on a particular element of Θ which is nutritional health of the child measured by an anthropometric index called the z-score. Furthermore, U_i is supposed to depend on the household characteristics π_ϕ and on a random term ξ. The utility function is:

$$U_i = U(X, L, \theta, \pi_\emptyset, \xi) \tag{2}$$

The idea is that households seek to maximize their well-being under the following budgetary constraint:

$$pX = \omega(T - L) + y \tag{3}$$

With p as the price vector, ω standing for the vector of salaries of household members, T is the number of working hours and y the non-monetary income. The production function of each component of θ could be specified in the following manner:

$$\theta = \theta(I, \pi_\gamma, \pi_\phi, \pi_\zeta, \eta) \quad (4)$$

Where I is health use π_γ the individual characteristics of the child (age, sex, etc.), π_ϕ, the household characteristics (education of parents, household income), π_ς is the community characteristics (ease of access to health care and other infrastructure) and η is the individual characteristics of the child, the household and the unobserved characteristics which affect the nutritional health of the child.

Normally we must estimate the production function of Equation 4. However, there is a problem of simultaneity in that the choice between the consumption of goods and services and that of inputs related to child health are done simultaneously. Indeed, any estimation that does not consider this problem risks being biased. To resolve the problem, we derive the health production function in a reduced form while maximizing household well-being. This function of the health of children only depends on the set of characteristics of the child, of the household or the parents as well as the characteristics of the environment or the community.

$$Z_i = f_i(\pi_\gamma, \pi_\phi, \pi_\zeta, \varepsilon) \quad (5)$$

With Z_i: Let the Z-score ε be a random term associated with the nutritional status of the child and also unobserved characteristics. It is this reduced form of the function of health production that was retained in most previous research studies. This health production function can be specified as follows:

$$Z_i = X_i^{'}\beta + \varepsilon_i \quad (6)$$

Z_i: measures the state of health of the child; $X_i^{'}$ estimates the set of explanatory variables and β is the vector of the estimation parameter.

However, all estimations of this function risk giving biased results. The data collection of the survey used cluster samples. Unobserved heterogeneity could also arise during data collection for Multiple Indicator Cluster Surveys. These surveys use cluster samples and within a cluster, there could be several households. For example, a cluster could be a locality. The latter could be correlated in a specific and unobserved manner (Cameron and Trivedi, 2005). The data of all the households to be found in this locality belongs

to the same cluster/locality, it could also be correlated to a specific cluster term that is common and unobserved. The variables of access to health care services and to drinking water are choice variables. These choice variables are considered to be endogenous. By including cluster-specific fixed effects $\boldsymbol{\alpha_c}$, in this case, the equation to be estimated is presented as follows:

$$Z_{ict} = \beta X'_{ict} + \delta W_{ic} + \alpha_c + \varepsilon_{ict} \quad (7)$$

With Z_{ic} : the nutritional status of child i of cluster c in time t; X'_{ict} is the vector of explanatory variables that vary in time; W_{ic} the variables that are constant in time (certain communal and individual characteristics); $\delta \; et \; \beta$ designated the parameters to estimate; and α_c represents the fixed effects clusters, and refers to unobserved characteristics that are specific to the community (cluster/locality) and common to all individuals, constant in time, but which differ from one cluster to the other and ε_{jct} is the error term.

In the presence of unobserved characteristics, any estimation using ordinary least squares (OLS) leads to biased results. According to Cameron and Trivedi (2005), in order to eliminate this specific character, it is possible to consider Equation 7 as a model in the panel data ($\mu_{ict} = \alpha_c + \varepsilon_{ict}$) . The problem is that the fixed or specific effect α_c could be correlated with X_{ic}. They suggest two approaches that allow for the control of the bias in the conception of data as already suspected. These methods also allow for the adjustment of the variance in estimated parameters. The first corresponds to the cluster-dummy-variable-model method and the second to the within-cluster-estimator (Cameron and Trivedi, 2005). In the first case, a dummy variable is associated with each cluster. Therefore, given the 440 clusters in the 2007 MICS and 414 in the 2015 MICS, we must create 440 and 414 dummy variables respectively. For feasibility reasons, this study will retain the second model given that the results arising from this equation are robust. The second uses the difference of each individual in relation to the mean of this cluster. This approach eliminates the specific character in the equation for the simple reason that, being common to all households in the same cluster, it cancels all constant variables when these variables are expressed in deviation according to the mean (Cameron and Trivedi, 2005). More precisely, by including the specific effect, it is possible to estimate the equation "within" Equation 8 as the difference of each observation in relation to the mean of each cluster.

We use clusters in our data. These have been used in MICS in 2007 and 2015. The equation of the fixed-effect cluster is presented as follows:

$$(Z_{ict} - \bar{Z}_{ct}) = \beta_0 + (X'_{ict} - \overline{X'}_{ct})\beta + (\varepsilon_{jct} - \bar{\varepsilon}_{ct}) \quad (8)$$

Here $(Z_{ict} - \bar{Z}_{ct})$ is the gap between the nutritional status of child i in cluster c in relation to the mean of the nutritional status of children within the same cluster;

β_0 is constant; $(X'_{ict} - \overline{X'}_{ct})$ is the deviation of vectors of explanatory variables of each child i in cluster c in relation to the mean of the same variables in the same cluster; β is the vector of estimated parameters of associated variables; $(\varepsilon_{jct} - \bar{\varepsilon}_{ct})$ is the error term of child i within cluster c in relation to the mean of children errors within the same cluster. The econometric results allow, first for an understanding of the determinants linked to the nutritional status of children and also the weight of each factor on this.

Measurement of the health status of children

The variables of results are regrouped in two categories: the variables related to the nutritional status of children (size-for-age, weight-for-age, weight-for-size) and those related to results of outcomes (delayed growth or chronic malnutrition, being underweight and severe malnutrition or wasting). To evaluate the nutritional status of children, we use anthropometric indexes. These indexes are dependent on age sex, size and weight of the child. From this information, one could calculate the following indexes[3]:

Size-for-age: This is an index that measures the growth of the child who is under the age of five. Children suffering from growth stunting, called chronic malnutrition, are small in relation to their age. Stunted growth is developed over a long period of time and it is often the result of inadequate food consumption, and/or a repeated infection.

Weight-for-size: This wasting index serves to monitor children and to measure short-term changes in their nutritional status. We talk of severe malnutrition or wasting when the child is too light in relation to their size (too thin). It is the result of a recent rapid weight loss or a lack of weight gain and it is reversible (in the short term) if conditions improve.

Weight-for-age: Allows for the measurement of underweight. Children suffering from underweight are too light in relation to their age. Underweight could be due to inadequate feeding or episodes of short-term illnesses. Generally, it occurs when the child is wasted and/or suffers from stunted growth.

The anthropometric indexes are expressed in terms of the number of standard deviation units in relation to the median of the population of international reference. This is a population of children who are well-nourished and healthy. Normally, two reference curves are used, namely: the curve of the National Centre for Health Statistics (NCHS) and the curve of Multicentre Growth Reference Study (EMRC). Our research relied on the EMRC z-score in order to evaluate the nutritional status. The z-score is a standardized indicator which offers the advantage of being more coherent because a unit has the same meaning in all indexes whether it may be the age group, weight,

or size. It is also considered by analysts as the best way to describe individuals. In conformity with the WHO regulations, we normalized this index and used the mean of the internationally used standard deviation of children of the same sex and the same age.

$$Z\_score_i = \frac{H_i - H_{median}}{\sigma_H} \quad (9)$$

Where H_i is the size of the child; H_{median} is the median size of the population used as a reference and σ_H is the standard deviation from the size of this reference population. Children involved are those aged between 0 and 59 months. The anthropometric indexes are expressed in terms of the number of standard deviation units in relation to the median of the population of international reference.

Data sources

The data used in the framework of this study are derived from MICS 2007 and 2015. The survey was designed to give information on the estimations over many indicators on the status of women and children at national level. MICS is considered as a baseline survey on fertility, health and the nutritional status of women and children. The survey was carried out by the country's National Bureau of Statistics (ONS) with assistance from the Unicef, the United Nations Population Fund (UNFPA) and the French Development Agency (AfD). The global MICS was developed by Unicef in the 1990s as an international survey programme to collect comparable data at an international level on many indicators on the situation of women and children. The surveys measure key indicators that allow countries to generate data to be used in policy formulation and programmes and to monitor the progress towards achieving the MDGs and other commitments agreed to at the international level. These data also allowed for the preparation and monitoring of the new reference document of Mauritania's Strategy for Accelerated Growth and Shared Prosperity (SCAPP) 2016-2030.

The survey design carried out under the MICS framework is a random sample stratified into two levels. The basic unit of the survey is the survey district such as is defined in the general population and housing census. In the first stage, clusters are drawn with a probability that is proportional to their household size in the survey district in 2000. In the second stage, a fixed number of households is drawn in each sampled survey district following a systematic sample selection process. To draw a final list of households to survey in this stage, an update of survey district samples was undertaken due to census of households in the selected district.

Three types of questionnaires are used in this survey: (i) a household questionnaire to collect information on household members; (ii) a questionnaire on women administered on each household with women aged between 15 to 49 years; and (iii) a questionnaire on children under the age of five living in the household. To better

respond to regional and international programming needs, the MICS guarantees representative of all 13 regions of the country. The regions are defined as the main source samples. The urban and rural zones within each region are identified as main strata of the sample. Nevertheless, some regions with a low population (Inchiri and Tiris-Zemmour) were regrouped. Some strata were oversampled to allow for a more reliable estimation on various indicators.

Table 1: Characteristics of the Multiple Indicator Cluster Survey, Mauritania

Sampling	MICS 2007	MICS 2015
Cluster	440	414
Rural	160	227
Urban	280	187
Households	10.361	11.765
Women aged 15–49 years	12.549	14.342
Men	1.529	4691
Children below the age of 5 years	8,672	10.663

Source: Author with data derived from MICS 2007 and MICS 2015

Definition of variables

The explanatory variables were chosen on the basis of both their availability in databases and on their pertinence from findings in reviewed literature. They were regrouped into six categories based om the characteristics of the child, mother, household, health care, environment or community in which the children live and geographical location. The characteristics of the child include the age and sex. We will introduce age to see from which point the immune system deteriorates and is strengthened (Boccanfuso and Bruce, 2010). The effect of the age of growth of the child could be considered in various ways: either in a quadratic form by revealing a squared variable (Glewwe, 1999); or through adopting range encoding in contiguous intervals (Strauss, 1990). In terms of sex, literature demonstrates that malnutrition is more pronounced in girls than in boys (Behrman, 1988). This tendency is tenuously linked to certain customs and beliefs which give more privileges to boys from birth.

In regard to parents' characteristics, in particular the mother, we considered the age and nutritional status of the mother and her level of education. The level of education of the mother plays an important role in the improvement of the child's nutritional status (Sahn, 1990). The education of the mother improves knowledge and practice of food hygiene. Educated women understand better the rules of hygiene and the care of children. Studies undertaken by Glewwe (1999) and Thomas et al (1990) show that education of the mother has a significant impact on the size of the children.

At household level, we have household income measured by the wealth index, which is a determinant of the health capital of children. Given the lack of data on income and household consumption, we use the wealth index as a proxy to evaluate

the long-term income of households and also to control for the household's capacity to provide food and acquire goods (Grira, 2007). This is calculated from the methodology of disaggregated data of Multiple Correspondence Analysis (ACP). Consequently, the index is decomposed into socio-economic classes (poorest, poor, average, rich and richest). These classes correspond to the first, second, third, fourth and fifth quintile of the distribution respectively. We also introduce the size and the gender of the head of household to clarify the decision-making power within that household.

In regard to variables concerning the community, the environment and health care, we include variables such as place of residence, region of residence and access to drinking water to highlight regional disparities. We also introduce variables on access to health care (Mariara et al, 2008), for example pre-natal and post-natal care, assistance at child birth, the use of methods of contraception for birth spacing and the vaccination of children.

4. Findings

In this section, we introduce elements that respond to the different research questions posed at the beginning of the study. We first present the descriptive results of the anthropometric indicators in the two surveys and the level of malnutrition according to socio-economic and socio-demographic characteristics. Thereafter, we present the main results of the determinants of nutritional health in children under five years old as well as their evolution.

Descriptive statistics

The results of three nutritional indicators, namely size-for-age (HAZ), weight-for-age (WAZ) and weight-for-size (WHZ) are presented in Table 2. The results indicate that the z-score size for age was on average -1.09 in 2007 and -1.12 in 2015, with an average of -1.11 in the two surveys. Moderate chronic malnutrition was at 27% over the two periods under study and at 11% for the severe form in 2007 and 10% in 2015. This rate of 27% conforms to that indicated in the MICS report for Mauritania in 2015. The z-score size-for-age of the two samples gave a similar tendency with those of Mariara et al (2008) in Kenya and by Namubiru (2014) in Uganda. The z-score weight-for-age was -1.34 in 2007 and -1.22 in 2015 with a mean of -1.27 in the two samples. Underweight in a moderate form was 31% in 2007 and 24% in 2015; it was 7% and 6% in the severe form in 2007 and 2015 respectively. The 2015 rate conforms to that indicated in the MICS report for Mauritania in 2015. The results demonstrate that children younger than 5 years old in Mauritania weighed less than Kenyan children (Mariara et al, 2008). In regard to severe malnutrition, the z-score weight-for-size was an average of -0.83 in 2007 and 2015. Moderate acute malnutrition was at 13% in 2007 against 15% in 2015 whereas severe acute malnutrition revolved around 2% and 3% in 2007 and 2015 respectively. The rates of moderate and acute severe malnutrition were similar to those found in the MICS report of 2015. By comparing our results with those obtained in Kenya[4] (Mariara et al, 2008) we note that Mauritanian children were more emaciated than Kenyan children.

Furthermore, the descriptive results show that stunted growth in children increases depending on age. It was 3% between the ages of 0 and 5 months and 22% between the ages of 24 and 35 months. As the age went higher than this, the proportion of stunted growth decreased before increasing between the ages of 48

and 59 months. Furthermore, statistics show a significant difference in the rate of malnutrition between the ages of 24 and 35 months and 36 and 47 months. In regard to the sex of the child, chronic malnutrition was higher in boys than in girls. The same thing was observed in Africa by Ssewanyana (2003) and in Kenya by Mariara et al (2008). The mean age of the mother with malnourished children was 30 years. The descriptive results also show that malnutrition was observed less in young mothers who were younger than 19 years of age with a significant difference between the two periods. Data also indicates that the prevalence of child malnutrition was 34% for mothers with no level of education against 28% for those who attended the Koranic school. Data shows a significant deviation between mothers with a primary level of education, with those of secondary level of education or higher, with 28% and 8% respectively.

Table 2: Mean of anthropometric indicators of children in Mauritania

Nutrition indicators	2007	2015	Difference
HAZ (z-score weight-for-age)	-1.09	-1.12	-0.036
WAZ (z-score weight-for-age)	-1.34	-1.22	0.121***
WHZ (z-score weight-for-size)	-0.83	-0.83	0.001
Probability of stunted growth (-2)	0.27	0.27	0.003
Probability of underweight (-2)	0.31	0.24	-0.067***
Probability of severe malnutrition (-2)	0.13	0.15	0.19
Probability of stunted growth (-3)	0.11	0.10	-0.004
Probability of underweight (-3)	0.07	0.06	-0.009**
Probability of severe malnutrition (-3)	0.02	0.03	0.008***

Source: Author with data derived from MICS 2007 and MICS 2015
Note: *** significant at a threshold of 1%; ** significant at a threshold of 5%; * significant at a threshold of 10%.

In regard to household characteristics, the average size did not differ in regard to malnourished or healthy children. However, the level of malnutrition was still high for children living in a household headed by a man, at 80% in 2007 and 68% in 2015. The sample spread does not indicate a significant difference between the gender of the head of the household in regard to the nutritional status of the child. The malnutrition deviation was significant according to the economic well-being of the household. Indeed, the mean of the wealth index is at 2.5 for children experiencing malnutrition against 0.33 for those who are healthy. In other words, the poverty of children is more pronounced in households that have a low retention of resources than those which are well endowed with resources. This wealth index has a tendency to deteriorate with time; the result conforms with that arrived at by Mariara et al (2008) in Kenya. In regard to the place of residence, children living in rural areas were more inclined to suffer from chronic malnutrition that those from urban areas. Chronic malnutrition was also high according to regions. The southern area (river) recorded the highest rate followed by South-East and Central. Malnutrition was less pronounced in the North and in the capital; Nouakchott.

Indicators of health care services are proxies for the availability of their use in the community. These are the proportions of individual responses on the use of different methods of contraception, assistance with childbirth, prenatal and postnatal care given by medical personnel and vaccination of children. The descriptive results show that the use of health care services is relatively low. Malnutrition is associated with low usage of contraception methods (between 14% and 20%), the low use of prenatal care, the quality of visits, the low rate of assistance during childbirth and the low use of visits. We observed a significant difference in use of health care services during the two periods. Child malnutrition is much more pronounced in households that do not have access to drinking water than in those with access. In 2007 and 2015, 61% and 46% of children, respectively, who suffered from malnutrition were from households that did not have access to drinking water.

Table 3: Malnutrition according to characteristics (as a percentage)

Variables	2007	2015	Difference
Child's characteristics			
Age in months	31.6	31.9	0.37
Age_0_5months	2.89	3.5	0.006
Age_6_11 months	5.99	5.18	-0.008
Age_12_23 months	22.8	22.2	-0.005
Age_24_35 months	22.3	25.3	0.029***
Age_36_47 months	9.18	4.4	-0.047***
Age_48_59 months	20.5	18.7	-0.017
SEX Boy	52.3	54.3	0.019
Mother's characteristics			
Age	30.3	30.4	0.11
Age lower than 19 years	6.14	4.28	0.01***
Age higher or equal to 19 years	93.3	94.7	0.01***
Nutritional status Married	90.1	89.6	-0.004
Education:			
None	34.5	27.8	0.072
Koranic	28.2	24.4	-0.03***
Primary	28.8	37.0	0.08***
Secondary/tertiary	8.29	11.2	0.02***
Characteristics of the household			
Household size	7.17	7.49	0.31***
Head of household; Man	80.5	68.8	-0.11***
Wealth index of household	2.5	0.33	-2.87***

continued next page

Table 3 Continued

Variables	2007	2015	Difference
Geographical characteristics			
Place of residence: Rural	70.0	62.9	-0.07***
South-East zone	19.6	22.7	-0.03***
Central zone	17.5	16.9	-0.006
Valley zone	38.3	38;7	0.002
Northern zone	9,4	7.12	0.02***
Nouakchott	10.4	11.1	0.006
Variables of health care			
Contraception	14.8	20.2	0.05***
Prenatal visits	43.5	80.6	0.37***
Quality of prenatal care	45.7	50.7	0.05***
Assistance at childbirth	30.2	34.9	0.04***
Postnatal visits	5.7	10.4	0.04***
Child vaccination	81.8	61.0	-0.20***
Characteristics of the environment			
Access to drinking water, Yes	38.6	53.1	0.14***

Source: Author with data derived from MICS 2007 and MICS 2015
Note: *** significant to a threshold of 1%; ** significant to a threshold of 5%; * significant to a threshold of 10%

Results of regressions

The results of determinants of nutritional health such as measured by the z-score size-for-age are given in Table 4. Columns (1) and (2) represent the results of estimations by OLS respectively and columns (3) and (4) are regressions with fixed-effect controls for each of the samples. Table 4 allows us in the first instance, to compare the results of the coefficients obtained for each survey and to compare the results of the OLS method and the fixed-effect method. By comparing the coefficients of the two models, the results allow us to establish that there are no significant unobserved characteristics at the community level that would be correlated with the determinants of nutritional state, from which we could simultaneously interpret the results of the two methods.

Child's characteristics

The results show that the variables related to the child's characteristics (age and sex) were significant determinants of their nutritional state. The health of children deteriorates as they grow older. This deterioration is least observed between 24 and 35 months. This is understandable given that this period corresponds to weaning. This period leads to particular attention being paid to the child's diet by the parents at that point. Beyond this age, the child is less monitored and the risk of succumbing to malnutrition is very high. The results also show a threshold effect between the age variable (in months) and

the squared age variable. These results show that in Mauritania, the nutritional state of a child deteriorates with aging until 38 months (3 years and 2 months). Empirical studies carried out in sub-Saharan African countries showed inflection points of four years of age in Côte d'Ivoire (Strauss, 1990) and 42 months in Uganda (Shariff and Anh, 1995).

In regard to the sex of the child, the coefficient is negative and significant. The results lead us to understand that boys are more inclined towards being in a state of lower nutritional health than girls. Specificities of household lifestyles more often keep girls close to their mothers from a very early age. In Mauritania, other specificities could apply in favour of girls from certain communities where force-feeding is practised from a very early age to ensure girls are more attractive to men in preparation for marriage.

Mother's characteristics

At the level of the characteristics of the parents, notably those of the mother, the results of the regressions showed that the age of the mother had a significant and positive impact on the nutritional state of the child. It could, therefore, be stated that the health of the child improves with the age of the mother. An aged mother was probably more mature and experienced and thus better placed to take care of their children than a younger mother. Matrimonial status had a positive and significant impact on the size of the child in all periods.

The education of the mother is seen as a major element in the state of nutritional health of a child. The impact of Koranic and primary education is less pronounced in terms of child growth. However, the coefficient related to the variable on level of secondary education or higher, was significant and was positively related to the growth of a child. The level of significance of this variable diminished with time (0.09 in 2007 and 0.03 in 2015). This could be explained by public authorities and non-governmental organization (NGOs) sensitization programmes in favour of children's health. The programmes target not only educated women, but also those who are illiterate. Indeed, a similar effect has been noted in sub-Saharan Africa (Morrisson and Linskens, 2000) and in Kenya in particular (Mariara et al, 2008), in Congo, Brazzaville (Ambapour and Hylod, 2008) and in Nigeria (Ukwuani and Suchindran, 2003).

Characteristics of the household

In regard to household characteristics, size, the gender of the household head and class play an important role in the nutritional health of the child. The size of a household was positively related to its nutritional state. This result is perhaps due to the fact that there would be enough food for the family. However, the positive sign of the coefficient was unexpected. The coefficient of the variable of gender of head of household did not have a significant effect on the growth of a child.

In terms of the standard of living in the household as demonstrated in the activity index, the results show a positive and significant impact on the growth of a child. An increase in the unit of household wealth (10%) led to an increase in the size of the child by between 0.6 and 1.6 points of z-score. These findings agree with those arrived

at by Sahn (1994) in Côte d'Ivoire. Equally, the result of our variable seems to be to those found in Congo-Brazzaville (Ambapour and Hylod, 2008) which was 4.3 points and in Bangladesh which was 0.8 points (Grira, 2007).

Table 4: Determinants of the nutritional state of children

	OLS		Fixed-effect clusters	
	(1)	(2)	(3)	(4)
	2007	2015	2007	2015
Child's characteristics				
Age_6_11 months	0.278***	-0.229***	0.259***	-0.297***
	(0.081)	(0.073)	(0.084)	(0.075)
Age_12_23 months	-0.589***	-1.001***	-0.587***	-1.038***
	(0.071)	(0.065)	(0.074)	(0.067)
Age_24_35 months	-0.360***	-1.062***	-0.381***	-1.042***
	(0.074)	(0.082)	(0.076)	(0.083)
Age_36_47 months	-0.557***	-0.960	-0.575***	-1.367**
	(0.107)	(0.623)	(0.112)	(0.633)
Age_48_59 months	-0.652***	-	-0.659***	-
	(0.078)		(0.080)	
Child is a boy	-0.093*	-0.142***	-0.096*	-0.140***
	(0.048)	-0.047***	(0.049)	(0.049)
Mother's characteristics				
Age	0.003	0.007*	0.005	0.008***
	(0.004)	(0.003)	(0.004)	(0.004)
Married mother	-	0.010	-	0.018
		(0.092)		(0.097)
Koranic education	-0.057	-0.087	-0,071	-0,048
	(0.068)	(0.075)	(0.082)	(0.084)
Primary education	0.050	-0.076	0.027	-0.124*
	(0.068)	(0.065)	(0.077)	(0.074)
Secondary/Tertiary education	0.182**	0.114	0.092	0.038
	(0.086)	(0.086)	(0.096)	(0.096)

continued next page

Table 4 Continued

	OLS		Fixed-effect clusters	
	(1)	(2)	(3)	(4)
	2007	2015	2007	2015
Characteristics of the household				
Household size	0.005	0.016***	0.006	0.009
	(0.008)	(0.006)	(0.009)	(0.007)
Head of household is Male	-0.022	0.009	-0.042	-0.004
	(0.063)	(0.054)	(0.072)	(0.061)
Wealth index of household	0.088***	0.147***	0.064*	0.165***
	(0.028)	(0.047)	(0.038)	(0.063)
Healthcare characteristics				
Contraception	0.073	0.121**	0.089	0.168***
	(0.066)	(0.060)	(0.071)	(0.064)
Assistance at childbirth	0.084	-0.068	0.087	-0.024
	(0.071)	(0.062)	(0.080)	(0.073)
Prenatal visits	0.114*	0.157**	0.057	0.193**
	(0.068)	(0,072)	(0.077)	(0.080)
Postnatal visits	-0,020	0.008	-0.037	-0.027
	(0.083)	(0.062)	(0.090)	(0.069)
Child vaccine	-0.022	0.040	-0.077	0.032
	(0.073)	(0.055)	(0.079)	(0.060)
Characteristics of the environment				
Access to drinking water	0.039	0.007	0.045	-0.040
	(0.053)	(0.052)	(0.072)	(0.062)
Geographical characteristics				
Rural	-0.224***	-0.058	-	-
	(0.077)	(0.075)		
South-East zone	0.102	-0.063	-	-
	(0.098)	(0.100)		
Central zone	0.146	0.060	-	-
	(0.094)	(0.095)		

continued next page

Table 4 Continued

	OLS		Fixed-effect clusters	
	(1)	(2)	(3)	(4)
	2007	2015	2007	2015
Geographical characteristics continued				
Valley zone	0.178**	0.172**	-	-
	(0.082)	(0.086)		
Northern zone	-0.226**	0.172*	-	-
	(0.088)	(0.093)		
Constant	-1.148***	-0.662***	-1.053***	-0.559***
	(0.203)	(0.184)	(0.205)	(0.188)
Observations	4.135	4.107	4.135	4.107
R^2	0.077	0.112		
F-test			1.47	1.51
Number of clusters			431	414
Variables of healthcare	Yes	Yes	Yes	Yes
Variables of environment	Yes	Yes	Yes	Yes
Geographical characteristics	Yes	Yes	No	No
Number of clusters	No	No	Yes	Yes

Source: Author with data derived from MICS 2007 and MICS 2015
Note: *** significant to a threshold of 1%; ** significant to a threshold of 5%; * significant to a threshold of 10%

Health care characteristics

Health care variables are proxies for the availability and use of health care services. The results of use of care in terms of contraception methods, childbirth that is assisted by a qualified health care professional, prenatal and postnatal visits and the vaccination of children are also important elements to consider in terms of improving child health. The use of methods of contraception acts significantly and positively on the growth of a child. The coefficient of the use of contraceptives is positive and significant for the survey of 2015. A recourse to methods of contraception after childbirth is especially a means of ensuring the development and the growth of the child. In regard to assistance at childbirth, the coefficient of the variable was not significant in models just like postnatal visits. However, prenatal visits seemed to be associated with a better state of health for the child. The coefficient associated with this variable was positive and significant over the two periods.

In conformity with the recommendation by WHO in the expanded vaccination programme (PEV), a child should complete all vaccination processes. To do so, the child has to receive a dose of BCG (protection against tuberculosis), three doses of

the vaccine against poliomyelitis, three doses of Dtcoq (diphtheria, tetanus and whooping cough) and a dose of a vaccine against measles. Children who were vaccinated increased in size by 0.03 centimetres, but the coefficient of this variable was not significant in the two regressions. We could therefore state that the variables of health care are considered as essential in the improvement of the nutritional status of the child (Mariara et al, 2008; Ssewanyana and Kasirye, 2012).

In regard to the environmental variable, water is a fundamental element in terms of guaranteeing the well-being of children. That is why this variable is at the heart of the MDGs and why it continues to be a challenge in the realization of the Sustainable Development Goals set for 2030. The coefficient associated with this variable was not significant on the nutritional status of children. We can then highlight that children in households that do not have access to drinking water are less privileged in terms of having a better state of health.

Geographical and communal factors

In regard to geolocalization variables, we used the place of residence and the zone in which the residence is situated. Results demonstrate that malnutrition was more pronounced in children in rural areas than those in urban areas. Children in rural areas were more inclined to have a lower z-score than their counterparts in urban areas. In regard to zones of residence, children from the valley/river area were more likely to be healthy than children from the northern regions. That area is conducive towards malnutrition. The coefficient of the Northern zone variable was negative in 2007, but not negative in 2015. This result could be explained by the fact that for several years, the public authorities, NGOs and other institutions had concentrated their energies towards eradicating malnutrition in this zone.

5. Conclusion and policy recommendation

This study was undertaken in an environment in which 43% of the active population experienced stunted growth during childhood; the country lost 13.3% of its GDP because of the cumulative effects of stunted growth on productivity; 4.5% of infant mortality is associated with undernourishment; and children affected by stunted growth complete 2.4 school years less than those who did not suffer from malnutrition (CEA, 2014). The objectives of the study were to understand the nature, evolution and frequency of malnutrition in children below the age of five in Mauritania and to identify the real and particular reasons associated with this phenomenon. From the z-score weight-for-age in order to evaluate the nutritional status, we used survey data from MICS on Mauritania in 2007 and 2015. The econometric method allowed us to elucidate the nutritional state of children under the age of five in Mauritania.

The anthropometric data collected showed a high prevalence of child malnutrition in Mauritania. The nutritional state of children under the age of five in the country in terms of z-score size-for-age deteriorated between 2007 and 2015. The children in 2015 were more stunted than the children in the 2007 survey. The z-score size-for-age decreased from -1.09 in 2007 to -1.12 in 2015, or a drop of -1.11. This justifies the fact that chronic malnutrition had not really dropped over the two periods. In terms of the real determinants of nutritional status, age of children has a negative impact on malnutrition. Girls seemed to have a relatively better level of nutrition than boys. In terms of mother's characteristics, age, matrimonial status and secondary or tertiary levels of education gave similar results to those found in existing literature on sustainable growth of children. Indeed, attending Koranic school and primary school were less significant on the growth of a child. These two levels of education notably correspond to the literacy level (knowledge of reading and writing). This is not enough to put the lessons learnt in terms of nutrition and health care into practice (Svedberg, 1990; Ambapour and Hylod, 2008). The variables relate to household characteristics, purchasing power captured by the gender of the head of household does not have any impact on the nutritional status of the child. The wealth index was significant and had a positive impact on the long-term nutritional status. In regard to the use of health care services, the recourse to methods of contraception and prenatal visits acted positively on the health status of a child. However, the coefficient of variables of assistance during childbirth, postnatal visits, vaccination and access to drinking water were not significant. At

the geographical level, children in rural areas were more inclined to suffer from malnutrition than those in urban areas.

The results of this study had implications for policy formulation to effectively tackle child malnutrition in Mauritania. It is possible to synthesize the results in order to bring out some central elements to help understand and act against child malnutrition. First, the analysis showed that a better educated mother understands the teachings related to child nutrition more clearly. This could be the objective of a good public policy action. It would involve strengthening policies aimed at improving the possibility of retention of girls in school at least until they complete the secondary level of education because universal primary education does not suffice in terms of reducing child malnutrition. Second, we observed that the standard of living of the household measured by the wealth index strongly and positively influenced the nutritional state of children and that rural households do not have sufficient resources to adequately cover the nutritional needs of a child. Policy makers should formulate policies targeted towards the support of rural households. For example, assistance that targets increasing resources within a household. Third, make health care more accessible to households at all times so as to substantially reduce child malnutrition by, for example, expanding and improving the coverage rate of multi-purpose health centres (prenatal and postnatal visits, assisted childbirth, family planning, vaccination of infants).

Notes

1. It is an extension of Blinder-Oaxaca's standard decomposition.

2. Undertaken under the framework of the programme on "New approaches to the fight against poverty in developing countries" by the development centre of OECD.

3. The nutritional status of an individual whose weight, size and age are known could be quantified using the mean of three indexes (Waterlow et al, 1977).

4. Mariara et al, (2008) found a z-score weight-for-size average of -0.19 in Kenya.

5. National Bureau of Statistics (ONS) [Mauritanie] and ORC Macro. 2001. Demographic and Health Surveys (DHS) Mauritania 2000-2001 . Perceptions on Force-feeding of girls in Mauritania.

References

Adewara, S.O. and M. Visser. 2011. "Use of anthropometric measures to analyse how sources of water and sanitation affect children's health in Nigeria". Environment for Development, 11: 1 23.

Ahovey, E.C. and C. Vodounou. 2004. "Pauvreté multidimensionnelle et santé de l'enfant: Quelques évidences de l'Enquête Démographique et de Santé du Bénin de 2001". Bénin: ENSAE.

Ambapour, S. and A.M. Hylod. 2008. "Pauvreté et Santé Nutritionnelle de l'Enfant au Congo". Document de travail, BAMSI. No. 15/2008.

Appaix, O. 2003. "Impact Économique de l'Investissement dans la Santé de l'Enfant. Communication pour les XXVI-èmes journées des économistes français de la santé". CERDI, Clermont-Ferrand.

Badji, M.S. 2006. "Analyse de l'Evolution des Déterminants de la Santé Nutritionnelle des Enfants âgés de moins de cinq ans au Sénégal". Perspective Afrique.

Badji, M.S. and D. Boccanfuso. 2006. "Niveau de Vie du Ménage et Santé Nutritionnelle des Enfants âgés de 0 à 59 mois au Sénégal: une Analyse Comparée avant/après la Dévaluation du franc CFA". Cahiers de Recherche, 06-08. Université de Sherbrooke.

Becker, G.S. 1965. "A Theory of the Allocation of Time". The Economic Journal, 75(299).

Behrman, J.R. 1988. "Nutrition, health, birth order and seasonality. Intrahousehold allocation among children in rural India". Journal of Development Economics, 28: 43–62.

Behrman, J. and A. Deolalikar. 1988. "Health and Nutrition." In Handbook of Development Economics, Chapter 14.

Boccanfuso, D. and O. C. Bruce. 2010. "Comprendre l'évolution de la santé des enfants de Moins de 5 ans en Guinée. Cahier de Recherche / Working Paper, GREDI 10–12, Canada.

Cameron, A.C. and P. K. Trivedi. 2005. "Microeconometrics Methods and Applications". United States of America, Cambridge University Press, New York.

CEA. 2014. "Le Coût de la Faim en Afrique: L'Incidence Sociale et Economique de la sous-nutrition chez l'Enfant en Mauritania". Rapport. Addis-Abeba : Uneca, 2014.

FAO. 2005. "Guide de Nutrition Familiale. Rome". Division de l'information. pp. 53.

FAO. 2017. "The State of Global Food Security and Nutrition 2017. Strengthen resilience in order to foster peace and food security". Rome, Italy: Food and Agriculture Organization of the United Nations.

Gangadharan, L. and P. Maitra. 2000. "Does child mortality reflect gender bias? Evidence from Pakistan". Melbourne: University of Melbourne.

Gibson, J. 2000. "Child Height, Household Resources, and Household Survey Method. University of Waikato, New Zealand.

Glewwe, P. 1999. "Why does mother's schooling raise child health in developing countries: Evidence from Morocco". The Journal of Human Resources. XXXIV (1): 124–159.

Grira, H. 2007. "Les Déterminants du statut nutritionnel au Matlab: une Analyse empirique". CES Working Papers No. 39. Centre d'Economie de la Sorbonne.

Grossman, M. 1972. "On the concept of health capital and the demand for health". Journal of Political Economy, 80(2): 223–55.

Handa, S. 1999. "Maternal education and child height". Economic Development and Cultural Change. 47(2): 421–439.

Horton, S. 1988. "Birth order and child nutrition status: Evidence from Philippines". Economic Development and Cultural Change, 36(2): 341–54.

Lachaud, J.P. 2001. "Urbanisation, malnutrition des enfants et genre au Burkina-Faso : une Approche économétrique spatiale". Econ Papers. Document de travail.

Latham, M.C. 2001. La Nutrition dans les pays en Développement. Université de Cornell.

Lefebvre, P. 2006. "Discrimination sexuelle dans les dépenses des ménages : Survol de littérature et évidences empiriques pour le Canada". L'actualité Economique, 32(1–2): 119–53.

Maitra, P. and R. Ray. 2001. The Impact of Resource Inflows on Child Health : Evidence from South Africa. Monash University.

Mariara, K. J., G. K. Ndenge and D. K. Mwabu. 2008. "Determinants of Children's Nutritional Status in Kenya: Evidence from Demographic and Health Surveys". Journal of African Economies, 18(3) : 363–87.

Morrisson, C. and C. Linskens. 2000. "Les facteurs explicatifs de la malnutrition en Afrique subsaharienne ". OCDE, Document de travail n° 167.

Mudubu, K. L. 1996. "Mortalité Infantile et Juvénile au Togo: Contribution des Facteurs Socio-économiques et Culturels ". Cahiers de l'IFORD, Yaoundé.

Mushkin, S. J. 1962. "Health as an investment". Journal of Political Economy, 70: 129.

Mussa, R. 2014. "A matching decomposition of the rural urban difference in malnutrition in Malawi". Health Economics Review, 4(1): 1–10.

Namubiru, L. 2014. "Effect of Household Poverty on Women's Fertility and Child Nutritional Status in Uganda". AERC thesis.

Office National de la Statistique (ONS) [Mauritanie] et ORC Macro. 2001. "Enquête Démographique et de Santé Mauritanie (DHS) 2000-2001". Calverton, Maryland, USA : ONS et ORC Macro.

Olaniyan, O. 2002. The Effects of Household Resources and Community Factors on Child Health: Evidence from Nigeria. Ibadan: University of Ibadan.

Pal, S. 1999. "An analysis of childhood malnutrition in rural India: Role of gender, income and other characteristics". World Development, 27(7): 1151–71.

Rakotondrabe F.P. 1996. "Les Facteurs de la Mortalité des Enfants à Madagascar. Les cahiers de l'IFORD", pp, 123.

RGPH. 2013. "Communique et dissémination de l'enquête sur le RGPH". Zone-fleuve.

Sahn, D.E. 1990. "The impact of export crop production on nutritional status in Côte d'Ivoire". World Development, 18(12): 1635–53.

Sahn, D.E. 1994. "The contribution of income to improved nutritional status in Côte d'Ivoire". Journal of African Economies, 3(1): 29–61.

Sahn, D.E. and H. Alderman. 1988. "The effects of human capital on wages and the determinants of labour supply in a developing country". Journal of Development of Economics, 29: 157–83.

Schultz, T. 1984. "Studying the impact of household economic and community variables on child mortality". Population and Development Review, 10: 215 35.

Schultz, T.W. 1961. "Investment in human capital". The American Economic Review, 51(1): 1–17.

Shariff, A. and N. Ahn. 1995. "Mother's education on child health: An econometric analysis of child anthropometry in Uganda". Indian Economic Review, 30(2): 203–22.

Ssewanyana, S. and I. Kasirye. 2012. "Causes of health inequalities in Uganda: Evidence from demographic and health surveys". African Development Review, 24: 327 41.

Ssewanyana, S. N. 2003. "Food Security and Child Nutrition Status among Urban Poor Households in Uganda: Implications for poverty alleviation". Research Paper No. 130. African Economic Research Consortium, Nairobi.

Strauss, J. 1990. "Households communities and preschool children's nutrition's outcomes: Evidence from rural Côte d'Ivoire". Economic Development and Cultural Change, 38(2): 232–61.

Svedberg, P. 1990. "Undernutrition in sub-Saharan Africa: is there a sex bias?" Journal of Development Studies, 26(3): 469–89.

Tharakan, C. T. and C. M. Suchindran 1999. "Determinants of Child Malnutrition - An Intervention Model for Botswana". Nutrition Research, 19(6), 843–860.

Thomas, D., J. Strauss and M. H. Henrique. 1990. "Child survival, height for age and household characteristics in Brazil". Journal of Development Economics, 33: 197–234.

Thomas, D., J. Strauss, M-H. Henrique. 1991. "How does mother education affect child height". The Journal of Human Resources, 26(2): 183–211.

Thomas, D., V. Lavy, and J. Strauss. 1996. "Public policy and anthropometric outcomes in Côte d'Ivoire". Journal of Public Economics, 61: 155–92.

Ukwuani, F.A. and C. M. Suchindran. 2003. "Implications of women's work for child nutritional status in sub-Saharan Africa: A case study of Nigeria". Social Science & Medicine, 56(10): 2109–21.

UNDP. 2015. "Report on the evaluation of the Strategic Framework on the Fight Against Poverty (CSLP) in Mauritania over the period 2001–2015".

UNICEF. 1998. "La Situation des Enfants dans le Monde 1998". Unicef House, 3 UN Plaza, New York, 10017, États-Unis.

Wagstaff, A., E. V. Doorslaer and N. Watanabe. 2003. "On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam". Journal of Econometrics, 112(1): 207–23.

Waterlow, J. C., R. Buzina, W. Keller, J. M. Lane, M. Z. Nichman and J. M. Tanner. 1977. "The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of ten years". Bulletin of the World Health Organization, 55: 489–98.

WFP. 2015. "Enquête de suivi de la sécurité alimentaire en Mauritanie". WFP, United Nations World Food Programme.

Yun, M. S. 2005a. "A Simple Solution to the Identification Problem in Detailed Wage Decompositions." Economic inquiry, 134.

Yun, M. S. 2005b. "Hypothesis test when decomposing differences in the first moment". Journal of Economic and Social Measurement, vol, 30, no. 4, pp. 295–304.

Ministère de l'Économie et des Finances. 2014. "Stratégie nationale de croissance accélérée et de prospérité partagée – SCAPP-2016-2030". République Islamique de Mauritanie.

Appendixes

Table 1: Descriptive statistics of Multiple Indicator Cluster Surveys 2007 and Multiple Indicator Cluster Surveys 2015

	MICS-2007				MICS-2015			
Variables	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
HAZ	-1.09	1.62	-5.91	6	-1.13	1.59	-5.99	5.97
WAZ	-1.34	1.24	-4.97	4.15	-1.22	1.19	-4.97	4.23
WHZ	-0.84	1.15	-5	4.94	-0.84	1.20	-5	4.92
Stunted growth	0.27	0.45	0	1	0.28	0.45	0	1
Underweight	0.31	0.46	0	1	0.24	0.43	0	1
Severe malnutrition	0.13	0.34	0	1	0.15	0.36	0	1
Chronic severe	0.11	0.32	0	1	0.11	0.31	0	1
Severe underweight	0.08	0.27	0	1	0.07	0.26	0	1
Acute severe	0.03	0.16	0	1	0.04	0.19	0	1
Age of the child in months	26.75	16.32	0	59	28.88	16.97	0	59
Age_0_5 months	0.11	0.31	0	1	0.09	0.29	0	1
Age_6_11 months	0.13	0.33	0	1	0.11	0.31	0	1
Age_12_23 months	0.20	0.40	0	1	0.21	0.41	0	1
Age_24_35 months	0.21	0.41	0	1	0.19	0.40	0	1
Age_36_47 months	0.07	0.25	0	1	0.04	0.19	0	1
Age_48_59 months	0.15	0.36	0	1	0.19	0.39	0	1
Child is a boy	0.51	0.50	0	1	0.50	0.50	0	1
Weight at birth	2.86	0.70	0.5	5.6	2.66	0.94	0.5	6
Mother's age	30.18	7.52	15	49	30.64	7.31	15	49
Married mother	0.91	0.29	0	1	0.91	0.29	0	1
No level	0.31	0.46	0	1	0.26	0.44	0	1
Koranic	0.26	0.44	0	1	0.21	0.41	0	1
Primary level	0.30	0.46	0	1	0.36	0.48	0	1
Secondary level	0.13	0.33	0	1	0.16	0.37	0	1
Household size	7.39	3.27	2	30	7.58	3.88	2	43

continued next page

Table 1 Continued

	MICS-2007				MICS-2015			
Variables	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Gender of head of household	0.80	0.40	0	1	0.69	0.46	0	1
Language: Arab	0.78	0.42	0	1	0.80	0.40	0	1
Language: pular	0.16	0.37	0	1	0.14	0.35	0	1
Index	2.83	1.44	1	5	-0.13	0.99	-1.58	2.533
Rural	0.61	0.49	0	1	0.56	0.50	0	1
South-East	0.17	0.38	0	1	0.18	0.38	0	1
Central	0.16	0.36	0	1	0.15	0.36	0	1
River	0.36	0.48	0	1	0.39	0.49	0	1
North	0.11	0.31	0	1	0.11	0.31	0	1
Nouakchott	0.16	0.37	0	1	0.13	0.34	0	1
Contraception	0.19	0.39	0	1	0.22	0.42	0	1
Prenatal visits	0.51	0.50	0	1	85	0.36	0	1
Quality of health care	0.51	0.50	0	1	0.58	0.49	0	1
Assistance at childbirth	0.39	0.49	0	1	0.43	0.49	0	1
Postnatal visits	0.08	0.27	0	1	0.12	0.33	0	1
Child vaccine	0.84	0.36	0	1	0.67	0.47	0	1
Access to drinking water	0.40	0.49	0	1	0.57	0.50	0	1

Source: Author with data derived from MICS 2007 and MICS 2015

Table 2: Proportion of children suffering from chronic malnutrition according to various socio-demographic characteristics, Multiple Indicator Cluster Surveys-2007

Variable	Obs	Mean	Standard deviation	Min	Max
Age of the child in months	2,003	31.62	14.60	0	59
Age_0_5 months	2,003	0.03	0.17	0	1
Age_6_11 months	2,003	0.06	0.24	0	1
Age_12_23 months	2,003	0.23	0.42	0	1
Age_24_35 months	2,003	0.22	0.42	0	1
Age_36_47 months	2,003	0.09	0.29	0	1
Age_48_59 months	2,003	0.21	0.40	0	1
Child is a boy	2,003	0.52	0.50	0	1
Weight at birth	137	2.79	0.72	1	5
Mother's age	1,992	30.34	7;67	15	49
Married mother	1,992	0.90	0.30	0	1
No level	2,001	0.35	0.48	0	1
Koranic	2,001	0.28	0.45	0	1
Primary level	2,001	0.29	0.45	0	1
Secondary level	2,001	0.08	0.28	0	1
Household size	2,003	7.18	2.99	2	25
Gender of head of household	2,003	0.81	0.40	0	1
Language: Arab	2,003	0.83	0.38	0	1
Language: pular	2,003	0.12	0.33	0	1
Index	2,003	2.54	1.36	1	5
Rural	2,003	0.70	0.46	0	1
South-East	2,003	0.20	0.40	0	1
Central	2,003	0.18	0.38	0	1
River	2,003	0.38	0.49	0	1
North	2,003	0.09	0.29	0	1
Nouakchott	2,003	0.10	0.31	0	1
Contraception	1,044	0.15	0.36	0	1
Prenatal visits	2,003	0.44	0.50	0	1
Quality of healthcare	936	0.46	0.50	0	1
Assistance at childbirth	2,003	0.30	0.46	0	1
Postnatal visits	2,003	0.06	0.23	0	1
Child vaccine	2,002	0.82	0.39	0	1
Access to drinking water	2,002	0.39	0.49	0	1

Source: Author with data derived from MICS 2007

Table 3: Proportion of children suffering from chronic malnutrition according to some socio-demographic characteristics Multiple Indicator Cluster Surveys 2015

Variable	Obs	Mean	Standard deviation	Min	Max
Age of the child in months	2,567	31.99	14.91	0	59
Age_0_5 months	2,567	0.04	0.18	0	1
Age_6_11 months	2,567	0.05	0.22	0	1
Age_12_23 months	2,567	0.22	0.42	0	1
Age_24_35 months	2,567	0.25	0.43	0	1
Age_36_47 months	2,567	0.04	0.21	0	1
Age_48_59 months	2,567	0.19	0.39	0	1
Child is a boy	2,567	0.54	0.50	0	1
Weight at birth	251	2.49	0.96	0.5	6
Mother's age	2,543	30.46	7.40	15	49
Married mother	2,543	0.90	0.30	0	1
No level	2,540	0.27	0.45	0	1
Koranic	2,540	0.24	0.43	0	1
Primary level	2,540	0.37	0.48	0	1
Secondary level	2,540	0.11	0.32	0	1
Household size	2,567	7.49	3.64	2	43
Gender of head of household	2,567	0.69	0.46	0	1
Language: Arab	2,567	0.84	0.36	0	1
Language: pular	2,567	0.11	0.31	0	1
Index	2,567	-0.34	0.90	-1.58	2.42
Rural	2,567	0.63	0.48	0	1
South-East	2,567	0.23	0.42	0	1
Central	2,567	0.17	0.37	0	1
River	2,567	0.38	0.49	0	1
North	2,567	0.07	0.26	0	1
Nouakchott	2,567	0.11	0.31	0	1
Contraception	2,269	0.20	0.40	0	1
Prenatal visits	1,585	0.81	0.39	0	1
Quality of healthcare	1,282	0.51	0.50	0	1
Assistance at childbirth	2,567	0.35	0.48	0	1
Postnatal visits	2,567	0.10	0.31	0	1
Child vaccine	1,456	0.61	0.49	0	1
Access to drinking water	2,567	0,53	0.50	0	1

Source: Author with data derived from MICS 2015

Table 4: Determinants of the nutritional state of children: Girls vs boys

Variables	Boy	Girl
Age_6_11 months	0.064	0.197***
	(0.068)	0.064
Age_12_23 months	-0.701***	-0.599***
	(0.059)	(0.057)
Age_24_35 months	-0.517***	-0.461***
	(0.065)	(0.068)
Age_36_47 months	-0.774***	-0.626***
	(0.111)	(0.128)
Age_48_59 months	-0.783***	-0.668***
	(0.081)	(0.084)
Mother's age	0.007**	0.005*
	(0.003)	(0.003)
Married mother	-0.012	0.308***
	(0.078)	(0.075)
Mother with Koranic education	-0.003	-0.056
	(0.058)	(0.060)
Mother with primary education	0.027	0.030
	(0.058)	(0.058)
Mother with secondary/tertiary level of education	0.228***	0.268***
	(0.072)	(0.070)
Household size	0.014**	0.013**
	(0.006)	(0.006)
Head of household is female	-0.056	-0.013
	(0.051)	(0.050)
Wealth index of household	0.005	-0.005
	(0.014)	(0.013)
Rural	-0.244***	-0.261***
	(0.061)	(0.059)
South-East zone	-0.057	-0.061
	(0.082)	(0.082)
Central zone	-0.059	0.052
	(0.085)	(0.083)
Valley zone	0.029	0.130*
	(0.071)	(0.072)
Northern zone	-0.081	0.020
	(0.078)	(0.078)

continued next page

Table 4 Continued

Variables	Boy	Girl
Contraception	-0.124	0.025
	(0.126)	(0.125)
Assistance at childbirth	-0.020	0.225***
	(0.056)	(0.054)
Prenatal visits	0.234***	0.068
	(0.057)	(0.057)
Postnatal visits	0.038	-0.001
	(0.066)	(0.060)
Child vaccine	0.022	0.040
	(0.054)	(0.054)
Access to drinking water	0.085*	0.019
	(0.045)	(0.045)
Constant	-1.000***	-1.287***
	(0,167)	(0,164)
Observations	5.820	5.650
R-squared	0.069	0.084

Source: Author with data derived from MICS 2007 and MICS 2015

Table 5: Determinants of the nutritional status of children: Rural vs urban

Variables	Urban	Rural
Age_6_11 months	0.501***	0.431***
	-0.063	(0.057)
Age_12_23 months	-0.306***	-0.324***
	(0.055)	(0.048)
Age_24_35 months	-0.409***	-0.354***
	(0.056)	(0.051)
Age_36_47 months	-0.557***	-0.388***
	(0.097)	(0.078)
Age_48_59 months	-0.330***	-0.390***
	(0.056)	(0.051)
Child is a boy	-0.122***	0.085*
	-0.036	(0.033)
Mother's age	0.005*	0.007**
	(0.003)	0.002
Married mother	0.227***	0.025
	(0.060)	(0.065)

continued next page

Table 5 Continued

Variables	Urban	Rural
Mother with Koranic education	-0.067	0.017
	(0.065)	(0.042)
Mother with primary education	0.062	0.052
	(0.054)	(0.045)
Mother with secondary/tertiary level of education	0.248***	0.305***
	(0.058)	(0.076)
Household size	0.010**	0.017***
	(0.005)	(0.005)
Head of household is female	0.113**	-0.075*
	(0.045)	(0.040)
Wealth index of household	0.058***	0.036**
	(0.016)	(0.014)
South-East zone	-0.030	0,094
	(0.082)	(0.089)
Central zone	-0.075	0.148*
	(0.077)	(0.090)
Valley zone	0.149***	0.198**
	(0.056)	(0.087)
Northern zone	-0.004	-0.141
	(0.058)	(0.160)
Contraception	0.040	-0.345***
	(0.105)	(0.114)
Assistance at childbirth	0.011	0.067
	(0.138)	(0.098)
Prenatal visits	0.260**	0.075
	(0.130)	(0.087)
Postnatal visits	0.274*	0.311*
	(0.148)	(0.164)
Child vaccine	0.179	0.111
	(0.126)	(0.085)
Access to drinking water	0.016	0.081
	(0.077)	(0.061)
Constant	-1.843***	-1.720***
	(0.191)	(0.156)
Observations	6.873	9.423
R-squared	0.061	0.039

Source: Author with data derived from MICS 2007 and MICS 2015

Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

www.aercafrica.org

Learn More

www.facebook.com/aercafrica

www.instagram.com/aercafrica_official/

twitter.com/aercafrica

www.linkedin.com/school/aercafrica/

Contact Us
African Economic Research Consortium
Consortium pour la Recherche Economique en Afrique
Middle East Bank Towers,
3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@aercafrica.org