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Health financing using insurance and child undernutrition: Evidence from the Nigeria demographic and health survey 2018

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ABSTRACT

The study examines the effect of health financing using insurance on child undernutrition, employing data from the 2018 Nigerian demographic and health survey. Undernutrition still contributes to child deaths in Nigeria, and health financing with regards to having health insurance, is yet to become a reality for many households. Despite several studies on the determinants of undernutrition, there remains the need for an examination of the effect of health financing, with a focus on health insurance. Using the NDHS, this study examined the effect of health insurance on the probability of child stunting and wasting. A limited dependent variable model was estimated using the maximum likelihood estimator; capturing urban and rural differentials, and an interaction model. The findings demonstrated a significant reduction in the likelihood of stunting in children both at national level and among rural households with health insurance. However, it significantly reduced the likelihood of wasting in children only among rural households. Not having a health insurance coverage, which was the case for a greater proportion of women, was found to significantly increase stunting, even among educated women; reduce wasting only if a woman is from a rich household; and increase wasting among rural households. Therefore, developing and implementing policies geared towards promoting wider and more inclusive health insurance coverage is important for improving child nutritional status and, consequently, the health status of children.

Contribution/Originality: Despite the existing literature on the determinants of undernutrition, little evidence exists on the effect of health financing, especially with specific consideration for health insurance. This study, therefore, specifically examines the effect of health insurance on child undernutrition. The primary contribution is to investigate the effect on child health using a microeconometric approach.

1. INTRODUCTION

Health insurance reduces out-of-pocket expenses, hence encouraging more healthcare utilization, and consequently, other health improvement expenses such as food, since cash at hand or cash in the pocket can now be used for other expenses rather than health care services. Undernutrition is the lack of energy, protein, and micronutrients in an adequate proportion for the growth, development, and maintenance of the body (Codoner-Franch & Belles, 2003). Undernutrition can be categorized into stunting, wasting, underweight (low weight for age), and the lack of important vitamins and minerals (micronutrient deficiencies). Stunting is defined as low height-for age. It is the result of chronic or recurrent undernutrition, usually associated with poverty, poor maternal health and nutrition, frequent illness, and/or inappropriate feeding and care in early life. Wasting is defined as low weight

for height. It often indicates recent and severe weight loss caused by not having food of adequate quality and quantity and/or after having frequent or prolonged illnesses. If not treated properly, child waste is associated with a higher risk of death. Nutrition-related factors account for 45 percent of deaths in children under five, and severe acute malnutrition increases a child's risk of death from diarrhea, pneumonia, malaria, and other common childhood illnesses (World Health Statistics, 2019).

Although Nigeria has achieved some reduction in stunting, 31.5% of under-five children are still stunted, which is higher than the average of 30.7% for the African region. In the case of wasting, 6.5% of under-five children still suffer from it and this is also higher than the average of 6.0% for the African region (Global Nutrition Report, 2023). Based on the Nigeria Demographic and Health Survey, the prevalence of stunting among children from 0 to 59 months of age was 32.0, with the prevalence for male and female children being 34.8 and 29.2, respectively. The prevalence of underweight children was 19.9, with male and female prevalences being 21.5 and 18.3, respectively. The benefits of eradicating undernutrition are not far-fetched. Children are better equipped to grow and develop to their full potential; as well as build immunity to fight disease and withstand crisis, when they are well-nourished.

Health expenditure in Nigeria is tilted more towards out-of-pocket expenditure, followed by public health expenditure, and majority of private health expenditure remains out-of-pocket. Out-of-pocket expenditures accounted for more than ninety percent of private expenditure on health consistently for twenty years, precisely from 1995-2014 (WDI, 2019). Public health expenditures accounted for only 23.9 percent of total health expenditures.Out-of-pocket expenditure ranged between 60.5 and 75.2 during the 1995-2014 period, thus accounting for more than 60 percent of total health expenditure in Nigeria. The WDI (2022) however, shows out-of-pocket expenditure to be consistently more than 70 percent of current health expenditure from 2006 to 2019. This is higher than the percentage of out-of-pocket expenditure in some African countries, such as Uganda, which ranges from 33.01- 54.48 percent: Ghana (27.60 – 54.18 percent), Rwanda (10.18 – 28.46) and South Africa 5.66 – 14.46 percent for the period 2000 to 2019. It is also greater than the low level of out-of-pocket expenditure maintained in developing countries, for instance, Canada, with a range of 14.50 - 16.61 percent, and Germany, which ranges from 12.28 - 14.51 percent for the period from 2000 to 2019 (WDI, 2022).

Nutrition has an expenditure effect because improved nutritional status is associated with increased expenditure on food intake and an appropriate diet, which help reduce child stunting and wasting. Thus, if the health expenditure of an individual or household is subsidized through health insurance, the left-over income for other consumption goods, including food or diet, increases, and consequently, the nutritional status also increases. Health insurance helps to spread the risk to a pool of individuals, thereby relieving individuals of the impoverishing effect of out-of-pocket expenditure on health care services. It also guarantees access to health care in the future the event of an illness.

In order to achieve universal health coverage, countries must be mindful of their health financing policies. The means of achievement, usually increased public financing either through government expenditure on health or health insurance provision, is necessary towards reducing the impoverishment effect of out-of-pocket expenditures. This is because the out-of-pocket expenditure requirement could be highly expensive and beyond the affordability of individuals and households at the particular time they seek healthcare. The resulting impoverishment could have reduced implications for other basic household expenditures, including food consumption, thus enhancing the problem of undernutrition. The reduction in food consumption and variety would negatively affect the nutrition of children in households and, consequently, their growth and development.

Health insurance saves people from having to make cash expenditures when they use health care. It allows for risk pooling, thereby increasing the possibility of health care access for the poor. This is because households can have more income left for other consumption activities, of which food takes a significant portion. This is important as it translates to influencing the nutritional status of children and, thus, their anthropometric characteristics. The benefits of social health insurance include reducing the financial burden borne by individuals and increasing access

to health for the poor and vulnerable (Hsiao, 2007). Government health expenditures also help reduce healthcare costs, thus reducing the impoverishing effect of healthcare expenditures.

Health financing has great implications for an economy in several ways, and one of them is its income inequality effect, as shown by Ataguba, Ichoku, Nwosu, and Akazili (2020). Nevertheless, beyond the availability of money or wealth, the type of health financing method chosen eventually determines how effective, efficient, and equitable a health system will be in improving health outcomes (Hsiao, 2007). However, one of its effects that cannot be underestimated is its first and direct impact on health outcomes. The importance of health financing for improved health outcomes cannot be overemphasized and just as shown by Atim, Arthur, Achala, and Novignon (2020) domestic health financing has strong reduction effects on child and maternal mortality. Astuti and Nugrohowati (2022) however, showed that holders of health insurance may not necessarily use healthcare facilities. What is the situation in Nigeria? Several other studies have also examined the effect of health financing in terms of health insurance access or utilization, government health expenditures, and out-of-pocket expenditures on health outcomes. However, health outcomes were measured in such studies as life expectancy at birth, infant mortality rate, and under-five mortality rate (Anyanwu & Erhijakpor, 2009; Dow & Schmeer, 2003; Hsiao, 2007) among others, while other measures of health outcomes that have been used include health care utilization and health care spending per capita (Ensor, Chhun, Kimsun, McPake, & Edoka, 2017). There is a need to consider the health outcomes of undernutrition. Also, studies have shown that there are several significant determinants of undernutrition, including parental education, child's characteristics, household resources, and food consumption, among others (Coates et al., 2018; Frost, Forste, & Haas, 2005; Horton, 1988; Meshram et al., 2012). However, there remains the need for an examination of the effect of health financing.

This study seeks to address the following questions: Beyond the link between health financing and other health outcomes, is there a link between health financing and nutritional status? What is the undernutrition effect of health financing with a focus on health insurance? Are there interaction effects of health insurance coverage on other possible determinants of undernutrition? This study therefore examined the effect of healthcare financing on child undernutrition with a focus on health insurance.

2. LITERATURE REVIEW

The literature reveals several empirical efforts. Palmer, Mueller, Gilson, Mills, and Haines (2004) emphasized the need for more reliable research on health financing and larger scale studies for low-income countries. In both low-income and middle-income countries, Black et al. (2013) estimated that undernutrition, including fetal growth restriction, suboptimal breastfeeding, stunting, wasting, and deficiencies of vitamin A and zinc, caused 45% of child deaths in 2011, resulting in 3·1 million deaths annually.

They explained that undernutrition, including stunting, wasting, and underweight, increased the risk of mortality in children, especially when children had infectious diseases. Kandala, Lang, Klasen, and Fahrmeir (2001) found undernutrition to be highest at the early age of children, specifically from birth, and it stabilized later on in both Tanzania and Zambia, but lasted slightly longer in Zambia.

The nutritional status of mothers has been shown to explain child health and anthropometric status. A mother's nutritional status, particularly acute undernutrition had a worsening effect on child's nutritional status than when a mother was obese, as shown by her high body mass index. They also found that spatial effects were important in explaining stunting. Kassie and Workie (2020) also showed that low body mass index of mothers increased the likelihood of undernutrition among under-five children in Ethiopia. Haque et al. (2022) also found maternal underweight to significantly increase the risk of stunting, wasting, and a child being underweight in south and southeast Asian countries.

Several studies have identified some factors that determine a child's nutritional status. Handa (1999) investigated the effect of maternal education on child height, a measure of child's nutritional status. Higher levels of

maternal education significantly increased child height, and it was progressively larger. The study, however, did not take current nutritional status into account, nor was there a consideration for how households finance healthcare utilization and its effect on child height. Parental education has been found to be positively significant in explaining the long-term heath status of preschool children (Senauer & Garcia, 1991). Ahmed, Ahmed, Roy, Alam, and Hossain (2012) found mother's education to be significant in rural Bangladesh. Other previous studies have also established the endogeneity of parental education in models of child health outcomes such as child mortality, among others, and attempted to control for it using instrumental variable estimation methods (Andriano & Monden, 2019; Makate, 2016; Puglisi & Busetta, 2019). Higher maternal education helps improve child nutritional status, and this is mostly explained by the socioeconomic status of the household (Frost et al., 2005). Murarkar et al. (2020) also found that maternal education explains under-five undernutrition in India.

Examining the trend of socioeconomic status, children from the poorest households and those in rural areas, as well as the lack of education status of mothers, have contributed to increased undernutrition in Nigeria (Akombi, Agho, Renzaho, Hall, & Merom, 2019). Using the 2016 Ethiopia demographic and health survey, Kassie and Workie (2020) also found that being from the poorest family worsened the undernutrition status of under five children. Income was found to be significant by Murarkar et al. (2020). This was also confirmed by Workie and Tesfaw (2021),who found low household wealth index significant in explaining child composite index anthropometric failure in Ethiopia. In Nigeria Ndukwu, Egbuonu, Ulasi, and Ebenebe (2013) found that children from families in the lower quartile class were more stunted than those from the higher quantile class.

Examining the existence of inequality in nutrient allocation, it was discovered that maternal education and not higher asset ownership were also found to help reduce inequalities in resource allocation among siblings (Horton, 1988). Households facing constraints in form of inadequate food supplies are more careful to equitably distribute resources to meet the needs of members than those without constraints (Coates et al., 2018). The price of food, particularly rice, was negatively significant to explain height for age but positively significant in the case of weight for height (Senauer & Garcia, 1991). Emphasizing the role of women empowerment and wealth, some studies have shown that high levels of autonomy among women and being in the middle class wealth index lower the odds of stunting and wasting (Boah, Azupogo, Amporfro, & Abada, 2019). The importance of a woman's age and marital status should not be underemphasized as shown by Mrema, Elisaria, Mwanri, and Nyaruhucha (2021) and Htwe (2021) which found that older maternal age had a reduced effect on stunting. Marital status in favour of being a married woman also had a reduction effect on stunting (Mrema et al., 2021). Masibo and Makoka (2012) and Htwe (2021) found that poor sanitation and hygiene, as well as unsafe drinking water, worsened child undernutrition in Kenya and rural Myanmar, respectively.

Using both the weighted least squares and the fixed effect estimators, Senauer and Garcia (1991) found a significant positive effect of women's wage on height for age. Child's age, gender, and birth order were also found to be significant. The effect of birth order on long-run nutritional status, was greater than on current nutritional status with earlier birth orders having more significant improvements than later birth orders (Horton, 1988). The impact of health financing was not taken into account.

Only few studies have linked the importance of health financing to a child's nutritional status. For instance, in order to improve child nutritional status, Bassett (2008) emphasized that conditional cash transfers to poor households would help improve short-term household consumption as well as offset costs associated with long-term human capital development.

In Bangladesh, improved child undernutrition was found to depend on reduction in food insecurity and increases in the educational status of mothers (Hasan, Ahmed, & Chowdhury, 2013).

The need to link changes in health financing to health outcomes cannot be overemphasized, for instance, user fees tend to prevent individuals with greater health risk from using health care services, although, it could be a redistributive effort towards improving welfare (Creese, 1991).

Despite the existing literature examining various factors that explain undernutrition, there still remains the gap of consideration for the role of health insurance. Long-term nutritional status, known as, stunting has also been given more attention than short-term nutritional status, which is wasting. However, they jointly give a broader view of the nutritional circumstances surrounding a child's health. A woman's education has been shown in the literature to significantly explain undernutrition; thus, it would be considered in this study, however, with the presence of health insurance coverage. A clear limitation in the literature is the little emphasis on urban-rural differentials, despite the substantial differences in these residences in developing countries that deserve attention.

3. METHODOLOGY

3.1. The Model

The model for this study is based on Schultz (1984) child health production function, which presents child mortality or morbidity for the ith mother (where i refers to a specific individual mother), Y_i as assumed to be a linear function of a vector of proximate biological inputs to child health, I_i, and a vector of persistent biological endowments of the child, B_i, and a random disturbance, e_{1i}.

$$Y_i = C_0 + C_1 I_i + C_2 B_i + e_{1i} \quad (1)$$

Where the C's are the parameters of this linearized biological/technical relationship.

The I_i are chosen by the woman and her family to minimize Y_i and to achieve other goals with her limited resources; B_i is again the child's health endowment, that component of child health due to either genetic or environmental conditions that cannot be influenced by the family's behavior but which is partially known to it, called health heterogeneity; the economic endowments of the individual, including human and nonhuman capital(E_i); the regional prices, programs and environmental constraints(X_r); preferences(P_i,)of the woman and her family; and e_{2i}, a stochastic disturbance (Schultz, 1984).

$$I_i = a_0 + a_1 E_i + a_2 B_i + a_3 X_r + a_4 P_i + e_{2i} \quad (2)$$

This relationship between the use of health inputs and all relevant exogenous variables is the reduced-form input demand function (Schultz, 1984). The parameters, a's, show how individuals respond to biological and socioeconomic constraints.

Finally, there implicitly exist reduced-form equations for the health outcomes that have the same arguments as Equation 2:

$$Y_0 = b_0 + b_1 E_i + b_2 B_i + b_3 X_r + b_4 P_i + e_{3i} \quad (3)$$

The parameters (b's) capture the combined effects of the demand behavior of individuals and technological constraints.

There is the need to control for the possible bias due to unobserved heterogeneity and the endogenous nature of some determinants (Schultz, 1984). We expand the model to incorporate the effect of health financing, utilizing data on the household's health insurance coverage.

Given that nutritional levels or anthropometric outcomes gauge a child's health status, the model for the study is thus a child anthropometric production function where the probability that a child is stunted or wasting is given as:

$$Z_i = f(P_i, C_i, H_i, E_i) \quad (4)$$

Where a child's height or weight is explained by a woman's characteristics (P) including education, age, marital status, employment status; husband's education and employment status; household endowments (H) (household wealth, household asset, household size, and gender of household head); child's characteristics (C) including birth order and gender; environmental characteristics (E) (urban/rural residence, presence of electricity, type of toilet facility used, source of drinking water); and health/medical care financing status captured by whether a household is covered by health insurance.

An interaction model was also considered where a child's height or weight is explained by some interacted variables such as education (ED), employment status (EM), and household wealth (H), which were interacted with health insurance coverage (HI) and other regressors presented as:

$$Z_i = f\left[(ED_i * HI_i), (EM_i * HI_i), (H_i * HI_i), X_{i,}\right] \quad (5)$$

3.2 Data and Source

The data was from the 2018 Nigeria Demographic and Health Survey (NDHS), and a total sample of 33,924 households was obtained from the survey. The Nigeria Demographic and Health Survey (2018) is a national sample survey with demographic and health indicators. Using a stratified, two-stage cluster design, the sample was selected with enumeration areas as the first-stage sampling units. A second stage consisted of a complete listing of households in each of the 1,400 selected enumeration areas. The sample consists of women aged 15-49 and men aged 15-59 in randomly selected households across Nigeria. The demographic and health survey protocol was reviewed and approved by the National Health Research Ethics Committee of Nigeria (NHREC) and the International Classification of Functioning, Disability, and Health (ICF) Institutional Review Board (Nigeria Demographic and Health Survey, 2018).

The nutritional status of a woman's child was measured using both long-term nutritional status and current or short-term nutritional status, which are child's height for age and child's weight for height, respectively. The z-scores of the child's height and weight are used based on the World Health Organization recommendation. Height and weight measurements were obtained from a total of 12,806 children under the age of 5 who were found eligible based on the standardization and re-standardization exercises guiding the measurement. However, valid height-for-age measurements were obtained for 97 percent of children who were eligible. Higher z-scores show improvements in nutritional status, while lower z-scores indicate malnutrition, which includes undernutrition. Health insurance coverage was measured as if household has health insurance = 1 and = 0 if otherwise. Child's height was measured as the probability that a child is stunted (probability = 1 if z-score for height-for-age is < -1 and 0 if > -1) and child's weight was measured as probability that a child is wasting (probability = 1 if z-score for weight-for-height is < -1 and 0 if > -1. Table 1 presents the definition of variables and descriptive statistics.

Table 1. Variable definition and descriptive statistics.

Variable	Definition	Mean	Standard deviation
Probability that a child is stunted	Probability = 1 if z-score for height-for-age is < -1 and 0 if > -1	0.276	0.447
Probability that a child is wasting	Probability = 1 if z-score for weight-for-height is < -1 and 0 if > -1	0.229	0.420
Health/Medical care financing status:			
Health insurance coverage	If household has health insurance = 1 and = 0 if otherwise	0.022	0.146
Health insurance non - coverage	If household has no health insurance = 1 and = 0 if otherwise	0.978	0.146
Parental characteristics:			
Mother has no education	Mother has no formal education.	0.454	0.498
Mother has primary education	Mother completed a primary education.	0.155	0.362
Mother has secondary education	Mother completed a secondary education.	0.313	0.464
Mother has post secondary education	Mother has any tertiary education.	0.078	0.268
Father has no education	Father has no formal education.	0.358	0.480
Father has primary education	Father completed a primary education.	0.144	0.351
Father has secondary education	Father completed a secondary	0.342	0.474

Variable	Definition	Mean	Standard deviation
	education.		
Father has post secondary education	Father has any tertiary education.	0.143	0.350
Mother's age	Age in years	29.552	6.819
Father's age	Age in years	39.962	9.544
Mother's marital status:			
Never in union	Whether mother is married	0.020	0.141
Married		0.920	0.271
Living withpartner/Widowed/Divorced/Separated		0.059	0.236
Mother's employment status			
Mother is not employed	Whether mother is currently working.	0.327	0.469
Mother is employed		0.673	0.469
Father's employment status			
Father is not employed	Whether father is employed.	0.031	0.174
Father is employed		0.966	0.181
Don't know		0.003	0.052
Household endowments:			
Household wealth:			
Poorest household	Categorized into four quintiles: Poorest, poor, rich, and richest.	0.238	0.426
Poor household		0.228	0.420
Middle household		0.211	0.408
Rich household		0.182	0.386
Richest household		0.141	0.348
Household asset:			
Has no TV	Categorized into whether household has a television, household has a car	0.586	0.493
Has a TV		0.414	0.493
Has no car		0.909	0.287
Has a car		0.091	0.287
Household size	Number of persons living in a house.	7.084	3.768
Gender of household head:			
Female	If household head is a female= 1 and = 0 if otherwise	0.094	0.292
Male		0.906	0.292
Child's characteristics:			
Birth order	Position of the child by birth	3.879	2.546
Child's gender			
Female child	Gender of the child	0.491	0.500
Male child		0.509	0.500
Environmental characteristics:			
Urban residence	Type of residence	0.345	0.475
Rural residence		0.655	0.475
Presence of electricity:			
Household has no electricity	Whether household has electricity	0.521	0.500
Household has electricity		0.479	0.500
Type of toilet facility:			
Flush toilet	Household toilet type	0.193	0.395
Pit/Bush toilet		0.782	0.413
Others		0.025	0.155
Source of drinking water:			
Pipe borne water	Where household gets drinking water	0.105	0.307
Borehole/Well/Spring/River/Rainwater		0.799	0.401
Bottled/Sachet water		0.050	0.219
Others		0.045	0.208

4. RESULTS

The study employed a limited dependent variable model, and based on the Hausman test, the maximum likelihood estimator was found to produce consistent estimates when the logit regression model was employed

rather than the probit. Robust standard errors were obtained to account for possible heterogeneity bias. Table 2 displays the maximum likelihood estimates for the model predicting the probability of stunting in a child. Model 1 is anon-interaction model and captures only the national level. Model 2 is the interaction model, where education, employment status,and household wealth interact with health insurance coverage. The results are presented at the national level and for urban and rural households. Table 3 presents the maximum likelihood estimates for the model of the probability that a child is wasting. Model 3 has no interaction and captures only the national level. Model 4 is the interaction model where education, employment status, and household wealth interact with health insurance coverage. The results are presented at the national level and for both urban and rural households. Table 4 presents the case for women that have no health insurance coverage, and the maximum likelihood estimates for both the model of the probability that a child is stunted and the model of the probability that a child is wasting are displayed.

Table 2. Model estimates of probability that a child is stunted.

Variable	Model 1 national	Model 2 national	Model 2 urban	Model 2 rural
Health insurance coverage	-0.183(-1.99)**	0.397(0.60)	-0.756(-0.51)	-13.719(-12.57)*
Parental characteristics:				
Mother has no education	RC	RC	RC	RC
Mother has primary education	0.148(3.58)*	1.374(2.77)*	2.423(2.76)*	1.350(1.95)
Mother has secondary education	0.085(2.03)**	0.571(1.38)	1.699(2.16)**	-0.207(-0.30)
Mother has post secondary education	-0.072(-1.05)	0.725(1.68)	1.694(2.10)**	0.445(0.56)
Father has no education	RC	RC	RC	RC
Father has primary education	0.133(3.07)*	0.463(0.74)	-0.329(-0.22)	0.223(0.31)
Father has secondary education	0.117(2.88)*	0.759(1.16)	-0.772(-0.58)	1.691(2.20)**
Father has post secondary education	0.126(2.38)**	0.901(1.42)	-0.555(-0.42)	1.677(2.08)**
Mother's age	0.006(1.95)	0.008(2.60)*	0.006(1.13)	0.010(2.41)**
Father's age	-0.005(-2.66)*	-0.006(-3.23)*	-0.010(-3.00)*	-0.004(-1.74)
Mother's marital status:				
Never in union	RC	RC	RC	RC
Married	-0.139(-2.01)**	-0.193(-2.80)*	-0.393(-3.82)*	-0.011(-0.12)
Living with partner/Widowed/Divorced/Separated	Omitted	Omitted	Omitted	Omitted
Employment status				
Mother is not employed	RC	RC	RC	RC
Mother is employed	0.041(1.43)	-0.078(-0.38)	0.286(1.11)	-0.677(-1.68)
Father is not employed	RC	RC	RC	RC
Father is employed	-0.048(-0.64)	-0.225(-0.41)	-0.613(-1.13)	14.190(13.81)*
Don't know	-0.059(-0.22)	Omitted	Omitted	Omitted
Household endowments:				
Household wealth:				
Poorest household	RC	RC	RC	RC
Poor household	-0.031(-0.79)	-0.887(-1.70)	Omitted	-0.886(-1.63)
Middle household	0.037(0.76)	-1.909(-2.48)**	0.135(0.30)	-2.427(-2.82)*
Rich household	0.049(0.76)	-1.990(-2.88)*	-0.239(-0.74)	-2.145(-2.75)*
Richest household	-0.050(-0.60)	-1.912(-2.66)*	Omitted	-2.738(-3.16)*
Household asset:				
Household has no TV	RC	RC	RC	RC
Household has a TV	0.116(2.84)*	0.190(5.66)*	0.092(1.69)	0.242(5.73)*
Household has no car	RC	RC	RC	RC
Household has a car	-0.087(-1.83)	-0.110(-2.36)**	-0.196(-3.00)*	-0.007(-0.10)
Household size	0.017(4.14)*	0.015(3.65)*	0.025(3.46)*	0.008(1.74)
Gender of household head:				
Female household head	0.383(8.13)*	0.419(8.97)*	0.439(6.26)*	0.398(6.32)*

Variable	Model 1 national	Model 2 national	Model 2 urban	Model 2 rural
Male household head	RC	RC	RC	RC
Child's characteristics:				
Birth order	-0.005(-0.55)	-0.006(-0.81)	-0.004(-0.31)	-0.008(-0.86)
Female child	-0.041(-1.64)	-0.043(-1.73)	-0.080(-1.90)	-0.024(-0.76)
Male child	RC	RC	RC	RC
Environmental characteristics:				
Urban residence	RC	RC	RC	RC
Rural residence	-0.030(-0.94)	-0.051(-1.67)	-	-
Household has no electricity	RC	RC	RC	RC
Household has electricity	0.080(2.28)**	0.110(3.38)*	0.114(1.94)	0.102(2.61)*
Type of toilet facility				
Flush toilet	-0.438(-4.69)*	-0.531(-5.73)*	-0.405(-3.15)*	-0.554(-3.98)*
Pit/Bush toilet	-0.400(-4.54)*	-0.462(-5.30)*	-0.373(-3.04)*	-0.467(-3.66)*
Others	RC	RC	RC	RC
Source of drinking water				
Pipe borne water	0.074(0.96)	0.072(0.93)	0.071(0.71)	0.020(0.16)
Borehole/Well/Spring/River/ Rain water	0.186(2.73)*	0.180(2.64)*	0.285(3.28)*	0.046(0.41)
Bottled/Sachet water	0.098(1.09)	0.036(0.41)	0.180(1.68)	-0.281(-1.54)
Others	RC	RC	RC	RC
Wald chi(2)	332.46	279.94	133.15	507.17
Prob>chi2	0.0000	0.0000	0.0000	0.0000

Note: ** and * represent significance at the 5% and 1% level respectively.

4.1. The Probability that a Child is Stunted

The first model (model 1) was estimated for the probability of a child being stunted. It was estimated at national level. The overall model was highly statistically significant. Children from households with health insurance coverage were significantly less likely to be stunted. It is a fact that health insurance guarantees access to health care when the need arises in future. This encourages increased utilization of health care services and reduces the trade-off effect on maintaining good nutrition when income has to be redirected from other consumption needs to paying for health care when a child is sick. Women with a primary and secondary education were significantly more likely to have children who were stunted than those with no education. Primary and secondary education alone may not necessarily equip mothers with the nutritional information they need to take care of children and ensure a balanced diet. However, women who had postsecondary education were less likely to have stunted children than those with no education, although it was not significant. This is similar to Handa (1999) and Ndukwu et al. (2013), which found significant improvements in child height for mothers with higher education. Murarkar et al. (2020) also found mother's education to significantly explain stunting.

However, some studies have also found weaker associations between women's education and child health in the literature for sub-Saharan Africa (Hobcraft, 1993).

Having a husband or partner with a primary, secondary, or postsecondary education strangely increased the likelihood that a child was stunted. A woman's age was not significant. This could occur if older women lack the necessary education and knowledge about nutrition for childcare. This is contrary to Mrema et al. (2021) and Htwe (2021), which found age to be significant because older mothers had a reduced risk of having stunted children than younger mothers. On the otherhand, a woman was less likely to have stunted children as her husband's age increased.

Given the effect of marital status, a child's risk of stunting was lower for married women than for single women. This is expected because the combined resources of both partners in marriage, in terms of their knowledge and income, enable children from such homes to have more access to nutritious diet than their counterparts. This supports the findings of Mrema et al. (2021).

The fact that a woman was currently working had no significant effect on whether a child was stunted or not. Similarly, ahusband's employment status was insignificant. The wealth status of households was not significantenough to explain the probability that a child was stunted. Thus, household income and socioeconomic status were proxied by the employment status of a woman and her husband, and household wealth did not significantly explain the probability that a child is stunted. This is contrary to Handa (1999); Akombi et al. (2019); Kassie and Workie (2020) and Workie and Tesfaw (2021). When it came to the impact of household assets, children from households with televisions were more likely to experience stunting than those without. Ownership of a car, however, was not significant.

Household size and female-headed households were highly significant in explaining whether a child was stunted or not. Larger household sizes increased the likelihood of a child being stunted. The competition for household resources is higher for households with more members because the resources per person declines as household size increases. Stunting was more likely to occur in children from female-headed households. This could be due to reduced income in the absence of a spouse to support.

The birth order, sex of the child, and area of residence were not significant. Households that have electricity, were more likely to have children who were stunted than those with no electricity and this was significant. Therefore, rather than improving health status, having electricity reduced it. Could having electricity imply an increased trade-off of nutrition expenditures for that of electricity?

Having a flush toilet and a pit or bush toilet significantly reduced the likelihood that a child was stunted compared to other types of toilets (including bucket toilet) that do not ensure that household defecations stay outside and away from the immediate household environment.

The source of drinking water had an insignificant effect on the probability that a child was stunted in the cases of drinking pipe-borne water and drinking bottled or sachet water. However, drinking borehole, well, spring, river, rain water, significantly increased the probability that a child was stunted compared to drinking from other sources. This is similar to Masibo and Makoka (2012) and Htwe (2021) which found that poor sanitation and hygiene, as well as unsafe drinking water, worsened child undernutrition.

4.1.1. The Interaction Model

The second model (model 2) is the interaction model, which involves interacting education, employment status, and household wealth with health insurance coverage. The model was estimated at the national level, taking into account both urban and rural households. At the national level health insurance coverage was insignificant. This was also the case among urban households. However, it was highly significant among rural households, and it reduced the likelihood of a child being stunted.

A woman's education was insignificant even when such women had health insurance coverage, except for the case of women who had a primary education and health insurance coverage; they significantly had children that were more likely to be stunted than those mothers with no education but had an insurance coverage for their health. However, among urban households, mothers with primary, secondary, or postsecondary education were significantly more likely to have stunted children even when they had health insurance coverage than mothers with no education. This is surprising and takes us to the question how much health care the insurance actually covers so as to guarantee access to health care when the need arises without cash payments. A woman's education at all levels was insignificant among rural households, even when such women had health insurance. This is contrary to Handa (1999) and Ndukwu et al. (2013) which found improvements in child height for mothers with higher levels of education.

Husband's education was insignificant at the national level and in urban areas. However, having a secondary or postsecondary education was significant among rural households, though it increased the likelihood that a child

would be stunted. Thus, having an educated husband did not guarantee reduced stunting among children in rural areas.

Women were less likely to have stunted children as their husband or partner's age increased, and this was highly significant at the national level and in urban areas but insignificant among rural households. However, older women were more likely to have stunted children, and this was surprisingly significant at the national level and in rural areas. This is possible when such more mature women still lack the education and nutritional knowledge necessary to be able to make the right decisions about the nutritional needs of children. However, a woman's age was not significant among urban households. This is contrary to Mrema et al. (2021) and Htwe (2021) which found age to have a significant negative effect on undernutrition.

Married women had a significantly lower likelihood that their child would be stunted than women who had never been in a union. This emphasizes the importance of marriage and the resulting partnership and collaboration it offers, which are important for improving child nutritional status. Mrema et al. (2021) also had a similar finding. This was significant at the national level and among urban households, but not significant among rural households.

The employment status of a woman and her husband was insignificant enough to explain the probability that a child was stunted at the national level and in urban areas. However, even though a woman's employment was insignificant in rural areas, having a husband or partner who was employed was highly significant, though it increased the probability of stunting in children.

When household wealth was interacted with health insurance coverage, only children from the middle, rich, and richest households were significantly less likely to be stunted than those from the poorest households. This was significant both at the national level and among rural households. It was thus important that children be from households that were not poor in order to prevent stunting. This is similar to the findings of Handa (1999); Ndukwu et al. (2013); Akombi et al. (2019); Kassie and Workie (2020) and Workie and Tesfaw (2021). Household wealth was, however, insignificant among urban households.

Household assets such as having a television significantly increased the chances of a child being stunted at the national level and in rural areas, but were insignificant in urban areas.

However, having a car significantly reduced the probability of child stunting at the national level as well as among urban households, but was not significant among rural households. Thus, the socioeconomic status of households is important, as having more wealth and assets (a car and not just a TV) reduces undernutrition in children. Larger household size was highly significant in increasing the probability that a child was stunted at the national level and among urban households, but was insignificant among rural households.

Residing in a female-headed household increased the likelihood that a child would be stunted compared to residing in a male-headed household. This was significant on the national level, as well as for urban and rural households. This may be due to the burden of single parenting without the financial support of a spouse.

The birth order and sex of a child were not significant at the national level and in both urban and rural areas. This is contrary to Horton (1988) who found birth order to be significant.

The area of residence, whether urban or rural, was insignificant. Households with electricity were more likely to have stunted children compared to those without electricity. This could be due to the fact that having electricity does not necessarily mean having steady and constant electricity. While urban households found it insignificant, it gained significance at the national level and for rural households.

Households with a flush toilet or a pit or bush toilet were less likely to have stunted children than those with other types of toilets, including bucket toilets which do not ensure that human faeces go far from the house. This was significant at the national level, as well as among both urban and rural households. Thus, proper hygiene and sanitation are important for maintaining good nutritional levels in children. Households drinking water from sources such as boreholes, wells, springs, rivers, or rainwater were more likely to have stunted children than those with other sources of drinking water. Sources of drinking water, including pipeborne water and bottle or sachet

water were not significant. This was the case at the national level, as well as among urban households. However, it was not significant among rural households.

Thus, health insurance coverage, both at national level and among rural households, significantly explains the probability of stunting in children. Having health insurance significantly reduces the probability of stunting in children. Household wealth category of middle, rich, and richest households was significant only when such households had health insurance. The type of toilet facility used and source of drinking waterwere also significant. Masibo and Makoka (2012) and Htwe (2021) also found that poor sanitation and hygiene, as well as unsafe drinking water, significantly worsened child undernutrition. Residing in a female-headed household and in a larger household significantly increased the probability of stunting.

Table 3. Model estimates of probability that a child is wasted.

Variable	Model 3 national	Model 4 national	Model 4 urban	Model 4 rural
Health insurance coverage	-0.041(-0.45)	1.110(1.78)	1.005(0.95)	-10.763(-10.43)*
Parental characteristics:				
Mother has no education	RC	RC	RC	RC
Mother has primary education	0.094(2.14)**	1.241(2.28)**	3.099(2.52)**	0.522(0.67)
Mother has secondary education	0.052(1.16)	1.112(2.35)**	2.360(2.03)**	1.235(1.52)
Mother has post secondary education	0.030(0.43)	0.892(1.81)	2.067(1.74)	1.352(1.50)
Father has no education	RC	RC	RC	RC
Father has primary education	0.083(1.79)	0.456(0.68)	-2.146(-1.48)	0.690(1.04)
Father has secondary education	0.082(1.91)	0.146(0.20)	-2.378(-1.92)	0.743(0.87)
Father has post secondary education	0.030(0.54)	0.323(0.45)	-2.300(-1.84)	0.848(1.01)
Mother's age	0.009(2.69)*	0.013(3.81)*	0.013(2.46)**	0.012(2.81)*
Father's age	-0.005(-2.49)**	-0.006(-2.99)*	-0.012(-3.64)*	-0.002(-0.82)
Mother's marital status:				
Never in union	Rc	Rc	Rc	Rc
Married	-0.024(-0.33)	-0.057(-0.76)	-0.213(-1.98)	0.105(1.00)
Living with partner/Widowed/Divorced/Separated	Omitted	Omitted	Omitted	Omitted
Employment status				
Mother is not employed	Rc	Rc	Rc	Rc
Mother is employed	0.060(1.97)	-0.008(-0.04)	0.381(1.47)	-0.788(-1.98)**
Father is not employed	Rc	Rc	Rc	Rc
Father is employed	-0.090(-1.14)	-0.604(-1.18)	-1.050(-1.90)	11.608(11.85)*
Don't know	-0.207(-0.72)	Omitted	Omitted	Omitted
Household endowments:				
Household wealth:				
Poorest household	Rc	Rc	Rc	Rc
Poor household	-0.108(-2.53)**	-1.015(-1.95)	Omitted	-1.088(-2.00)**
Middle household	0.004(0.07)	-1.830(-2.32)**	-0.246(-0.50)	-2.206(-2.46)**
Rich household	0.041(0.59)	-2.139(-2.96)*	-0.516(-1.54)	-2.659(-3.14)*
Richest household	0.076(0.87)	-1.771(-2.37)**	Omitted	-2.717(-2.97)*
Household asset:				
Household has no TV	RC	RC	RC	RC
Household has a TV	0.125(2.88)*	0.205(5.81)*	0.178(3.11)*	0.222(4.92)*
Household has no car	RC	RC	RC	RC
Household has a car	-0.090(-1.80)	-0.083(-1.69)	-0.169(-2.52)**	0.041(0.57)
Household size	0.009(1.97)	0.007(1.58)	0.022(2.98)*	-0.002(-0.45)
Gender of household head:				
Female household head	0.364(7.43)*	0.384(7.87)*	0.402(5.60)*	0.372(5.55)*
Male household head	RC	RC	RC	RC
Child's characteristics:				
Birth order	-0.013(-1.43)	-0.017(-2.05)**	-0.032(-2.26)**	-0.011(-1.03)
Female child	-0.010(-0.37)	-0.011(-0.40)	-0.063(-1.44)	0.020(0.61)
Male child	RC	RC	RC	RC
Environmental characteristics:				
Urban residence	RC	RC	RC	RC
Rural residence	-0.126(-3.81)*	-0.153(-4.74)*	-	-
Household has no electricity	RC	RC	RC	RC
Household has electricity	0.082(2.19)**	0.107(3.09)*	0.098(1.58)	0.116(2.75)*
Type of toilet facility				

Variable	Model 3 national	Model 4 national	Model 4 urban	Model 4 rural
Flush toilet	-0.315(-3.21)*	-0.347(-3.57)*	-0.330(-2.52)**	-0.361(-2.37)**
Pit/Bush toilet	-0.284(-3.06)*	-0.344(-3.76)*	-0.377(-3.01)*	-0.305(-2.17)**
Others	RC	RC	RC	RC
Source of drinking water				
Pipe borne water	0.085(1.05)	0.079(0.97)	-0.008(-0.08)	0.173(1.26)
Borehole/Well/Spring/River/Rain water	0.123(1.72)	0.113(1.59)	0.097(1.10)	0.141(1.12)
Bottled/Sachet water	0.113(1.22)	0.104(1.14)	0.120(1.11)	-0.088(-0.45)
Others	RC	RC	RC	RC
Wald chi(2)	343.51	329.22	122.98	404.09
Prob>chi2	0.0000	0.0000	0.0000	0.0000

Note: *and ** denote significance at the 1% and 5% significance level respectively.

4.2. The Probability that a Child is Wasting

The third model (model 3) was estimated for the probability thata child is experiencing wasting. It was estimated at national level. Health insurance coverage was not significant. Women with only a primary education were more likely to have a child who was wasted than women with no education. Murarkar et al. (2020) also found mother's education to be significant.

Having a secondary or post secondary education was not significant. The literature of sub-Saharan Africa also reveals weaker associations between women's education and child health (Hobcraft, 1993).

Husband's education was not significant. An increase in a woman's age also increased the likelihood of having wasted children, however, the likelihood significantly declined as her husband's age increased. Being married did not significantly affect the likelihood of wasting children. Employed women have more likely to have wasted children than unemployed women. A husband's employment status was not significant. Poor households were less likely to have children who were wasted than poorest households. This shows the importance of household income differences and this is similar to Handa (1999); Akombi et al. (2019); Kassie and Workie (2020) and Workie and Tesfaw (2021). However, middle, rich, and richest households did not have significant improvements in child wasting when compared with poorest households. Ownership of a television by households increased the likelihood of wasting in, while having a car was not significant. The results showed that the likelihood of wasting was significantly increased with increasing household size. If household resources remain constant, then resources per head would decline with an increasing number of household members. Female-headed households were significantly more likely to have wasted children than households headed by men. The birth order and sex of a child were insignificant enough to explain the probability of wasting in children. Rural households were less likely to have children who were wasted than urban households, and this was significant, implying that residing in an urban area did not necessarily mean improved nutrition.

Households with electricity were found to significantly have a higher likelihood of wasting children than those without electricity. Having electricity does not necessarily mean having steady and constant electricity. Thus, both the inability of households to afford electricity and the poor infrastructural provision of power supply, even to those who can afford it, could play out negatively. Having a flush toilet and a pit or bush toilet significantly reduced the likelihood of wasting compared to other toilet types, including the bucket toilet and similar less hygienic toilet types. This is similar to Masibo and Makoka (2012) and Htwe (2021) which also found that poor sanitation and hygiene, as well as unsafe drinking water, had a negative effect on child undernutrition. A household's source of drinking water was insignificant. This is contrary to Htwe (2021) which found that unsafe drinking water significantly worsened child undernutrition.

4.2.1. The Interaction Model

The fourth model (model 4) represents the interaction model for the probability that a child is experiencing wasting. It involved interacting education, employment status, and household wealth with health insurance

coverage. It was estimated at the national level and for urban as well as rural households. At the national level, health insurance coverage was insignificant. This was also the case among urban households. However, it was highly significant among rural households, and it reduced the likelihood of a child being wasted.

Women with a primary or secondary education that also had health insurance coverage were more likely to have children that were wasted than women with no education who had health insurance. Having a postsecondary education and health insurance were insignificant. This was obtained at the national level and among urban households. This is contrary to Murarkar et al. (2020). However, all levels of education were insignificant among rural households. This is also contrary to Ahmed et al. (2012) which found mother's education to be significant in rural Bangladesh and India, respectively.

Having an educated husband or partner who had health insurance coverage was not significant at the national level and in both urban and rural areas. A woman's age was highly significant, though the probability of being wasted increased as mothers grew older in both urban and rural areas. On the other hand, the older a woman's husband or partner is, the less likely it is that a child will be wasted. However, it was not significant for rural households.

At the national level, a woman's marital status was insignificant for both urban and rural households. Employment status of a woman and her husband was insignificant at the national level and for urban households, but among rural households, employed women were significantly less likely to have wasted children than women who were not working, while women who had an employed husband or partner were more likely to have wasted children than those who had an unemployed husband.

When household wealth was interacted with health insurance, all household wealth categories, including poor households, middle, rich, and richest households, were found to have children who were less likely to be wasted than children from the poorest households who had health insurance. This was significant both at the national level and among rural households. This is similar to Handa (1999); Akombi et al. (2019); Kassie and Workie (2020) and Workie and Tesfaw (2021). Household wealth was, however, insignificant among urban households.

Ownership of a television by households was significant at the national level and in both urban and rural residences. However, owning a car was not significant at the national level or in rural areas, but it was significant among urban households. Household size was surprisingly insignificant at the national level and in rural areas, but it had a positive effect on the probability of wasting in urban residences. A female-headed household was more likely to have a child experiencing wasting than a male-headed household. This was the case at the national level and in both urban and rural areas. A child's birth order was significant, such that children with higher birth order were less likely to be wasted than lower birth order children. This was significant at the national level and among urban households. This is contrary to Horton (1988) which found earlier birth orders had more improvements in height for age than later birth orders. However, the difference was not statistically significant in rural areas. The sex of a child was insignificant at the national level, urban and rural households. Households with electricity had a higher likelihood of wasting than those without. It was, however, not significant only among urban households. Having a flush toilet and having a pit or bush toilet were more likely to reduce wasting in children than other toilet types at the national level and in both urban and rural areas. This supports the findings of Masibo and Makoka (2012) and Htwe (2021). Source of drinking water was insignificant at the national level and in both urban and rural areas. It was however significant in Htwe (2021).

4.3. Robustness Check

4.3.1. The Case for Non-Health Insurance Coverage

Since only 2.2 percent of women in the study had health insurance coverage, we further confirmed the estimates we have above, which show the significance of health insurance in improving child nutrition as measured by the anthropometric outcomes considered.

Thus, we went further to check for the effect of not having health insurance coverage (which was the case for 97.8 percent of women) on the nutritional status of children. The estimates are presented in Table 4. We found that at the national level, as shown in model 5a, not having a health insurance significantly increased undernutrition levels in the form of stunting.

A woman's education had a positively significant effect, such that educated women were more likely to have stunted children.

This shows that despite the fact that education improves the knowledge and awareness of health issues, it does not necessarily guarantee the prevention of child undernutrition when such households do not have health insurance, which could relieve them of out-of-pocket expenditure-related burdens. Therefore, it is important to be able to access health care especially when desperately needed by an individual who lacks cash at hand to immediately attend to such health care needs.

Thus, the impoverishing effect of out-of-pocket payments could leave women and their households with fewer resources for other needs, including nutritional needs of children. Husband's education and household wealth were, however, insignificant.

When we interact education and household wealth with non health insurance coverage at the national level, as shown in model 5b, a woman's education remained significant in increasing child stunting when a woman had no health insurance coverage. This is similar to Ahmed et al. (2012) and Murarkar et al. (2020) which also found mother's education to be significant. Husband's education and household wealth also remained insignificant even when interacted with non-health insurance coverage.

In the case of wasting, non-health insurance coverage was significant in the model for child wasting such that women, with no health insurance were less likely to have wasted children. Not having a health insurance was rather insignificant in urban locations, however, it was highly significant in increasing the likelihood of child wasting among the households of rural women as shown in model 6c.Table 4 presents the results at both the national and rural household levels.

At the national level, as shown in model 6a, a woman's possession of a primary education and her husband's possession of a secondary education increased the likelihood of child wasting if they had no health insurance. Household wealth was negatively significant only among rich households, thus, rich households were less likely to have wasted children even when they had no health insurance than poorer households. This could be explained by the fact that they have more resources to cater for the nutritional needs of their children than poorer households. This shows the importance of higher earnings to be able to prevent the impoverishing effect of out-of-pocket expenditures when there is no health insurance. Income of the family was also found to be a significant determinant of undernutrition in India (Murarkar et al., 2020). The result also supports the findings of Handa (1999); Akombi et al. (2019); Kassie and Workie (2020) and Workie and Tesfaw (2021).

Thus, not having a health insurance adversely affected the nutritional status of children at the national level in the case of stunting. In the case of wasting, not having a health insurance worsened its incidence only among rural households. Having an education could not ensure a reduction in stunting and wasting if the woman had no health insurance coverage, and this is shown in both model 5 and 6.

Thus, policies aimed at promoting greater health insurance coverage should be considered paramount since they have the potential to improve child health.

Table 4. Model estimates of probability that a child is stunted or wasted for the case of non health insurance coverage.

Variable	Model 5a (Stunting) national (No interaction)	Model 5b (Stunting) national (Interaction model)	Model 6a (Wasting) National (Interaction model)	Model 6c (Wasting) rural (Interaction model)
Non health insurance coverage	0.183(1.99)**	0.102(0.79)	-1.369(-2.15)**	11.148(10.72)*
Parental characteristics:				
Mother has no education	RC	RC	RC	RC
Mother has primary education	0.148(3.58)*	0.139(3.34)*	0.102(2.32)**	0.074(1.41)
Mother has secondary education	0.085(2.03)**	0.082(1.95)	0.080(1.83)	0.040(0.72)
Mother has post secondary education	-0.072(-1.05)	-0.098(-1.39)	0.077(1.09)	-0.043(-0.39)
Father has no education	RC	RC	RC	RC
Father has primary education	0.133(3.07)*	0.133(3.08)*	0.085(1.85)	0.140(2.61)*
Father has secondary education	0.117(2.88)*	0.118(2.91)*	0.090(2.13)**	0.047(0.91)
Father has post secondary education	0.126(2.38)**	0.125(2.33)**	0.033(0.59)	0.116(1.55)
Mother's age	0.006(1.95)	0.006(1.98)**	0.011(3.22)*	0.011(2.45)**
Father's age	-0.005(-2.66)*	-0.005(-2.65)*	-0.005(-2.28)**	-0.002(-0.62)
Mother's marital status:				
Never in union	RC	RC	RC	RC
Married	-0.139(-2.01)**	-0.137(-1.97)**	-0.030(-0.40)	0.127(1.20)
Living with partner/Widowed/Divorced/Separated	Omitted	Omitted	Omitted	Omitted
Employment status				
Mother is not employed	RC	RC	RC	RC
Mother is employed	0.041(1.43)	0.044(1.51)	-0.031(-0.16)	-0.568(-1.58)
Father is not employed	RC	RC	RC	RC
Father is employed	-0.048(-0.64)	-0.046(-0.61)	-0.692(-1.28)	12.058(12.48)*
Don't know	-0.059(-0.22)	-0.056(-0.21)	Omitted	Omitted
Household endowments:				
Household wealth:				
Poorest household	RC	RC	RC	RC
Poor household	-0.031(-0.79)	-0.027(-0.69)	-0.631(-1.26)	-0.519(-1.03)
Middle household	0.037(0.76)	0.046(0.94)	-0.741(-1.62)	-0.660(-1.19)
Rich household	0.049(0.76)	0.065(1.00)	-0.955(-2.31)**	-0.867(-1.57)
Richest household	-0.050(-0.60)	-0.041(-0.50)	-0.535(-1.43)	-0.707(-1.47)
Household asset:				
Household has no TV	RC	RC	RC	RC
Household has a TV	0.116(2.84)*	0.113(2.80)*	0.189(5.18)*	0.193(4.08)*
Household has no car	RC	RC	RC	RC
Household has a car	-0.087(-1.83)	-0.089(-1.88)	-0.080(-1.64)	0.035(0.48)
Household size	0.017(4.14)*	0.017(4.12)*	0.008(1.76)	-0.001(-0.27)
Gender of household head:				
Female household head	0.383(8.13)*	0.383(8.15)*	0.371(7.58)*	0.361(5.37)*
Male household head	RC	RC	RC	RC
Child's characteristics:				
Birth order	-0.005(-0.55)	-0.005(-0.57)	0.014(-1.62)	-0.009(-0.82)
Female child	-0.041(-1.64)	-0.041(-1.65)	-0.011(-0.42)	0.020(0.61)
Male child	RC	RC	RC	RC
Environmental characteristics:				
Urban residence	RC	RC	RC	RC
Rural residence	-0.030(-0.94)	-0.029(-0.92)	-	-
Household has no electricity	RC		RC	RC
Household has electricity	0.080(2.28)**	0.078(2.22)**	0.124(3.65)*	0.102(2.44)**
Type of toilet facility				
Flush toilet	-0.438(-4.69)*	-0.436(-4.67)*	-0.309(-3.17)*	-0.335(-2.20)**
Pit/Bush toilet	-0.400(-4.54)*	-0.399(-4.53)*	-0.316(-3.43)*	-0.275(-1.95)
Others	RC	RC	RC	RC
Source of drinking water				
Pipe borne water	0.074(0.96)*	0.073(0.95)	0.047(0.58)	0.168(1.22)
Borehole/Well/Spring/River/Rain water	0.186(2.73)*	0.184(2.70)*	0.072(1.02)	0.148(1.19)
Bottled/Sachet water	0.098(1.09)	0.097(1.08)	0.100(1.09)	-0.078(-0.40)
Others	RC	RC	RC	RC
Wald chi(2)	332.46	334.97	208.57	-
Prob>chi2	0.0000	0.0000	0.0000	-

Note: * and ** denote significance at the 1% and 5% significance level respectively.

5. CONCLUSION

This study examined the effect of health financing on child undernutrition.It focused on the case for health insurance. The study estimated the effect of health insurance on the nutritional status of a child by capturing the probability that a child was stunted or wasted. Health insurance was found to be a significant tool for improving the health of children, as shown by their nutritional status. At the national level and among rural households, health insurance significantly reduced the likelihood of stunting a child. However, it significantly reduced the likelihood of wasting in children only among rural households. There is the need to substantially increase and widen the extent of insurance coverage, especially in urban areas. Not having health insurance coverage, which was the case for a greater proportion of women, was found to significantly increase stunting, even among educated women, and reduce child wasting only if a woman is from a rich household. Therefore, in addition to improving the educational attainment and awareness of women, policy interventions that would support household income would reduce the burden of out-of-pocket payments through health insurance. Household wealth significantly reduced undernutrition only when such households were not among the poorest and had health insurance coverage. This again underscores the importance of access to health insurance, even among the wealthy.

Rural households found that not having health insurance coverage increased wasting. Thus, promoting wider and more inclusive health insurance coverage is important for improving child nutritional status and child health, especially among the poor and vulnerable.

Despite the low coverage level of health insurance in the country, the study still found some significant potential in its ability to improve child nutrition and health. Therefore, improved and wider health insurance coverage is necessary for achieving significant reductions in undernutrition. This is pertinent for policymaking on child health.

This study is therefore useful for policymaking on child health since it has not only shown the importance of health insurance but also revealed other factors that are important for reducing child undernutrition. Government policy should therefore target an increase in the provision of basic social amenities such as improved toilet facilities and safe drinking water since these environmental factors, which ensure good hygiene and sanitation, were found to reduce child undernutrition.

Eradicating child marriage and early childbearing should be a policy target since mother's ages significantly explain child undernutrition.

This study focused solely on health insurance as a component of health financing. Further studies on child undernutrition could consider the effects of other aspects of health financing, such as out-of-pocket health expenditures and public health expenditures.

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