A multilevel analysis of the effect of household wealth inequality on under-five child under-nutrition: Evidence from the 2003 Nigeria Demographic and Health Survey

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Citation

O Uthman. *A multilevel analysis of the effect of household wealth inequality on under-five child under-nutrition: Evidence from the 2003 Nigeria Demographic and Health Survey*. The Internet Journal of Nutrition and Wellness. 2007 Volume 6 Number 2.

Abstract

Objective: To investigate the association between household wealth inequality and childhood under-nutrition. The second aim was to determine whether there is significant neighborhood variation in childhood malnutrition and whether neighborhood variation is explained by health risk factors at the individual-level and community-level.
Design: Multilevel logistic regression analysis was applied on 5079 children nested within 171 communities
Setting: The 2003 Domestic and Health Survey data from Nigeria
Main outcome: Under-five malnutrition: Stunting, underweight, and wasting
Main results: The results indicated that the household wealth status had strong negative effects on both stunting and underweight, but not on wasting. The effect was stronger on stunting than on underweight. The odds of stunting decline monotonically with increase in economic status. The relationship remains unchanged when controlling for child's age, sex, birth order, duration of breast-feeding and mother's characteristics (age at childbirth, BMI and education). With household wealth status and other factors controlled, the child's sex, breastfeeding duration, household size, and mothers' education attainment all have statistically significant effects on risk of stunting.
Conclusion: The study has demonstrated that household wealth status is an important determinant of chronic childhood malnutrition, and that there is significant neighborhood variation in childhood malnutrition, even after controlling for effects of both individual- and community-level characteristics. These findings have important implications for targeting policy as well as the search for left-out variables that might account for this unexplained variation.

INTRODUCTION

In Nigeria, as in many other developing countries, under-nutrition is one of the leading causes of childhood morbidity and mortality. Childhood under-nutrition affects physical and cognitive growth, impairs the immune system, and increases the risk of morbidity and mortality [1,2,3]. In developing countries around the world, an estimated 148 million children are stunted, 127 million are under-weight, and 46 million are wasted[4]. According to a recent comparative risk assessment by the World Health Organization, under-nutrition is estimated to be, by far, the largest contributor to the global burden of disease[5]. Many people in developing countries still live in extreme poverty[4] and in these countries economic growth tends to benefit only a small group of advantaged and affluent people and causes growing inequality in health and nutrition that affects particularly vulnerable groups of the population, such as children[6]. Economic well-being at the household level operates mainly through availability of better food, more hygienic living conditions, and better access to health services in affecting the health and nutritional status of children [7].

While there are numerous studies on childhood malnutrition in Nigeria [8,9,10,11,12,13,14,15,16,17], majority of these studies have looked at the contributions of individual-level (socioeconomic and family planning) characteristics. A growing body of literature considers the importance of understanding of determinants of childhood malnutrition through an integrated analysis that considers linkages between demographic, household, and community structures. Thus, the contextual aspect of child malnutrition needs to be explored to understand the process of malnourishment as a whole. To expand our understanding of the effects of household wealth status on the risk of childhood malnutrition, the study argue that it is necessary to consider as additional risk factors the characteristics of the communities in which mothers and children live using multilevel analytic framework. Therefore, the purpose of this paper is to develop and test a model of childhood malnutrition that includes household wealth status, individual-level characteristics along with community-level characteristics. The second aim was to determine whether there is significant neighborhood variation in childhood malnutrition and whether neighborhood variation is explained by health risk factors at the individual-level and community-level.

METHODS

DATA SOURCE

This study uses data from the 2003 Nigeria Demographic and Health Survey (NDHS). It is based on information of 6219 children born within five years prior to the survey. The NDHS collected demographic, socio-economic, and health data from nationally-representative sample of 7620 women aged 15-49 years in 7864 households included in the survey. Methods used in the NDHS have been published elsewhere [18].

VARIABLES

RESPONSE VARIABLE

Anthropometric indicators were constructed using data on the children's age, height and weight. Three key anthropometric measures were calculated using the new WHO reference standard[19]: stunting: height-for-age that is less than the international reference value by more than two standard deviations; wasting: weight-for-height less than the international reference value by more than two standard deviations; and underweight: weight-for-age that is more than two standard deviations below the international reference value.

HOUSEHOLD SOCIOECONOMIC STATUS

The NDHS did not collect direct information on household income and expenditure. This study uses a household wealth index, estimated from asset variables using principal components analysis (PCA) [20,21,22,23,24], as a proxy indicator for household economic status in this analysis. Economic inequality is measured by dividing the wealth index into quintiles, with the lowest quintile representing the 20% poorest households and the highest quintile representing the 20% richest households in Nigeria.

CONTROL VARIABLES

Because household economic status is correlated with maternal nutrition and other socio-demographic factors that can also affect the nutritional status of children, the effects of household economic status on stunting are estimated after statistically controlling for the effects of these other potentially confounding factors [7,25,26,27]. These factors include the child's age, sex (boy, girl), high birth order (4+), duration of breast-feeding, full immunisation (no, yes); mother's age at childbirth, body mass index (BMI) (< 18.5, 18.5–24.9, ≥ 25.0 kg m^{-2}) and education (no education, primary or less, secondary or more), residence (urban, rural) and geographic region.

STATISTICAL ANALYSES

DESCRIPTIVE

The descriptive statistics show the distribution of respondents by the key variables. Values were expressed as absolute number (percentages) and mean (standard deviation) for categorical and continuous variables respectively.

MEASUREMENT OF SOCIOECONOMIC INEQUALITIES IN CHILDHOOD MALNUTRITION

Inequality in childhood malnutrition was measured using the illness concentration index (C) proposed by Wagstaff et al [28]. The concentration index is twice the area between the illness concentration curve (L(S)) and the diagonal with values ranging from +1 to -1. Its value is positive (negative) when it lies below (above) the diagonal. A negative illness concentration index indicates the existence of inequalities in health that are pro-rich (i.e. high income groups have less ill-health than low income groups). A positive concentration index implies inequalities in favour of the least advantaged socio-economic groups. If illness is distributed equally, the concentration curve overlaps with the diagonal (line of equality).

MULTILEVEL MODELLING

Given the hierarchical structure of the sample and the binary outcome, a logistic multilevel modeling approach was adopted [29] to estimate the effects of household economic status and other factors on childhood malnutrition. A two-level model with a binary response for a child i living in community j of the form:

(1) π_{ij} : y_{ij} Bernoulli(1, π_{ij})

The probability was related to a set of categorical predictors, X; and a random effect for each level, by a logit-link function as

(2) logit(π_{ij}) = log[π_{ij} / (1 - π_{ij})] = □0 + □X + u_{0j}

The linear predictor on the right-hand side of the equation consisted of a fixed part (□ + □X) estimating the conditional coefficients for the explanatory, and random intercept attributable to communities (u_{0j}).

The analysis was done in three steps. In Model 1 (empty model), no explanatory variable was included. In model 2, only household wealth status and individual-level factors were included. Model 3 controlled for household wealth status, individual and community-level factors. The results of fixed effects (measures of association) were shown as odds ratios (ORs) with 95% confidence intervals (CIs). The results of random effects (measures of variation) were presented as variance partition coefficient and percentage change in variance.

ETHICS

This study is based on secondary analysis of existing survey data with all identifying information removed. The survey acquired informed consent from mothers of the children included in this study before asking any questions and before obtaining anthropometric measurements.

RESULTS

The weighted descriptive statistics is presented in Table 1, 5079 children aged 0 – 59 months nested within 177 communities (census tracts) were analyzed in this study. The number of children per tract varied from 5 to 67 (average 27.8). One in every five children aged 0 – 59 months in Nigeria lives in the poorest 20% households. Children were more or less evenly distributed by household wealth status and child's sex. Forty-nine percent of the children were of forth or more birth order. Only 17% of children were fully immunized. Table 1: Sample distribution and prevalence of malnutrition (stunting, underweight, and wasting) among children aged 0-59 month(s) by household wealth status and other selected characteristics, Nigeria, 2003

Figure 1

Table 1: Sample distribution and prevalence of malnutrition (stunting, underweight, and wasting) among children aged 0-59 month(s) by household wealth status and other selected characteristics, Nigeria, 2003

	Total children		Under-five malnutrition		
	n	%	Stunted (%)	Underweight (%)	Wasted (%)
Nigeria	5079		36.1	20.8	9.5
Wealth status					
Poorest	1076	21.2	44.1	26.8	10.5
Poorer	1052	20.7	43.0	24.7	11.2
Middle	1012	19.9	41.8	21.7	9.0
Richer	974	19.2	31.6	19.6	8.8
Richest	965	19.0	18.4	10.3	7.7
Child's age (months), mean (SD)	26.9	17.2	28.4	27.6	24.9
Child's sex					
Female	2512	49.5	34.8	19.9	9.2
Male	2567	50.5	37.3	21.7	9.7
High birth order (4+)					
No	2595	51.1	34.3	20.8	9.7
Yes	2484	48.9	38.0	20.8	9.2
Breast feeding duration (Months) mean (SD)	14.8	7.0	16.2	16.1	14.4
Full immunization					
No	4214	83.0	38.4	22.4	9.8
Yes	865	17.0	25.2	12.9	8.1
Age (years) of mother at childbirth, mean (SD)	26.6	6.8	26.1	25.6	26.0
Education of mothers					
No education	2533	49.9	44.6	26.5	10.4
Primary	1190	23.4	35.0	19.3	9.7
Secondary or higher	1356	26.7	21.2	11.6	7.6
Occupation of mothers					
Not working	1746	34.4	36.5	23.5	10.6
Manual or agriculture	2251	44.3	37.3	20.0	9.1
Professional	1082	21.3	35.2	18.1	8.4
BMI (kg/m^2) of mothers					
Underweight	641	12.6	47.8	31.9	11.7
Normal weight	3306	65.1	37.7	22.2	10.0
Overweight	1132	22.3	24.8	10.5	6.8
Under-five in household (4+)					
No	4347	85.6	35.0	20.3	9.6
Yes	732	14.4	42.9	22.6	8.8
Community-level factors					
Location of residence					
Urban	1569	30.9	28.4	16.8	8.6
Rural	3510	69.1	39.5	22.6	9.6
Geographic region					
North central	749	14.8	31.7	12.7	7.0
North east	1174	23.1	40.1	24.6	9.3
North west	1707	33.6	46.9	28.7	11.2
South east	321	6.3	16.7	6.1	3.1
South south	653	12.9	21.7	13.4	11.5
South west	475	9.4	27.3	16.4	9.2

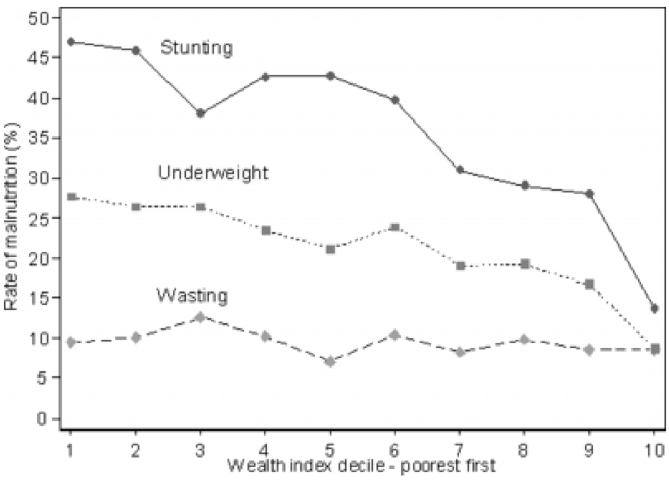
Abbreviation: BMI = body mass index

Half of the children had illiterate mothers, and 21% had mothers with secondary or more education. The mothers of 65% of the children had a normal weight, 13% were underweight, and 22% were overweight. The mothers of 36% of the children were unemployed. The rate of stunting is found to be the highest followed by low weight-for-age (underweight). Overall, 36% of children aged 0-59 months in Nigeria were stunted (Table 1). The prevalence of stunting and underweight declines as the household wealth status increases. Closer examination of the three states of child malnutrition (Figure 1) reveals that while stunting and underweight are responsive to improvements in the socio-economic status of the household, wasting does not appear to be sensitive. The overall concentration indices for stunting, underweight and wasting respectively are -0.14 (95% CI: -0.16 to -0.12; p=.001), -0.15 (95% CI; -0.18 to -0.12;

p=.001), and -0.06 (95% CI; -0.17 to 0.04; p=.067). The figures for stunting and underweight indicate statistically significant inequalities, which are pro-rich, that is those children in the lowest socio-economic strata bear a greater burden of malnutrition. However, this socio-economic gradient is not observed in wasting. The prevalence of stunting and underweight were higher among boys than girls. In addition, the prevalence of stunting and underweight were higher among children with high birth, not fully immunized, from large household size. Children of illiterate mothers had higher prevalence of child malnutrition. There are wide geographical variations in the rates of the three types of child malnutrition, with the rate difference between the regions. Stunting has the highest prevalence in the North east and North west.

Figure 2

Figure 1: Child malnutrition by household wealth deciles



EFFECT OF HOUSEHOLD ECONOMIC STATUS ON CHILD MALNUTRITION

Table 2 shows the estimates of unadjusted effects of household wealth status on stunting, underweight, and wasting. The results indicated that the household wealth status had strong negative effects on both stunting and underweight, but not on wasting. The effect was stronger on stunting than on underweight. The unadjusted odds of stunting are more than three times higher among children living in the poorest (lowest wealth index quintile) households than among children in the richest (highest wealth index quintile) households (odds ratio [OR] 3.31; 95% CI: 2.70 – 4.07). Children living in the second, third and fourth wealth quintile household were also at a greater risk of stunting than children living in the richest 20% households. The odds of stunting decline monotonically with increase in economic status.

Figure 3

Table 2: Odds ratio estimates of unadjusted effects of household wealth status on stunting, underweight, and wasting among children aged 0 – 59 month(s), Nigeria, 2003

	Stunting		*Underweight*		Wasting	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Wealth status						
Poorest	3.31 (2.70, 4.07)	.001	2.60 (2.04, 3.32)	.001	1.16 (0.85, 1.57)	.352
Poorer	2.96 (2.41, 3.65)	.001	2.38 (1.86, 3.05)	.001	1.29 (0.95, 1.75)	.101
Middle	2.76 (2.24, 3.41)	.001	2.08 (1.62, 2.68)	.001	0.97 (0.70, 1.35)	.863
Richer	1.76 (1.42, 2.18)	.001	1.79 (1.38, 2.31)	.001	1.09 (0.79, 1.50)	.599
Richest	1		1		1	

Abbreviations: OR – odds ratio, CI – confidence interval

The relationship remains unchanged when controlling for child's age, sex, birth order, duration of breast-feeding and mother's characteristics (age at childbirth, BMI and education), but the effect of economic status was reduced slightly (Table 3 Model 2).

Figure 4

Table 3: Effects of household wealth status on stunting (odds ratios and 95% CI; multivariable, multilevel logistic regression models, estimators adjusted for other selected characteristics) among children aged 0 – 59 months, Nigeria 2003

	Model 1	*Model 2*	Model 3
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Measures of association			
Individual-level factors			
Wealth status			
Poorest		1.79 (1.36, 2.36)***	1.79 (1.33, 2.41)***
Poorer		1.60 (1.23, 2.09)***	1.61 (1.22, 2.14)***
Middle		1.62 (1.25, 2.11)***	1.66 (1.27, 2.14)***
Richer		1.28 (1.01, 1.63)*	1.31 (1.02, 1.67)*
Richest		1	1
Child's age (months)		1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Male (versus female)		1.22 (1.08, 1.38)**	1.22 (1.08, 1.38)**
High birth order (4+)		1.17 (0.98, 1.38)	1.14 (0.96, 1.36)
Breast feeding duration (Months)		1.05 (1.03, 1.06)***	1.04 (1.03, 1.06)***
Full immunization		0.94 (0.78, 1.14)	1.00 (0.82, 1.20)
Age (years) of mother at childbirth		0.98 (0.97, 0.99)**	0.98 (0.97, 0.99)**
Education of mothers			
No education		1	1
Primary		0.90 (0.76, 1.07)	1.01 (0.86, 1.20)
Secondary or higher		0.61 (0.50, 0.75)***	0.70 (0.56, 0.86)***
Occupation of mothers			
Not working		1	1
Manual or agriculture		1.16 (0.96, 1.39)	1.07 (0.92, 1.25)
Professional		1.07 (0.91, 1.24)	1.22 (1.02, 1.47)*
BMI (kg/m^2) of mothers			
Underweight		1.18 (0.98, 1.43)	1.16 (0.96, 1.40)
Normal weight		1	1
Overweight		0.82 (0.69, 0.98)*	0.84 (0.71, 1.01)
Under-five in household (4+)		1.24 (1.04, 1.48)*	1.21 (1.01, 1.44)*
Community-level factors			
Rural (versus urban)			1.15 (0.95, 1.39)
Geographic region			
North central			0.72 (0.53, 0.98)*
North east			0.98 (0.72, 1.32)
North west			1.30 (0.97, 1.74)
South east			0.54 (0.38, 0.78)***
South south			0.65 (0.45, 0.92)*
South west			1
Measures of variation			
Community-level variance			
Variance [τ (SE)]	0.43 (0.08)***	0.16 (0.04)***	0.09 (0.03)**
VPC (%)	11.5	4.6	2.7
Explained variation (%)	reference	62.5	78.3
Model fit statistics			
DIC (-2log likelihood)	6225	5998	5956

Abbreviations: VPC-variance partition coefficient; SE-standard error; BMI-body mass index

*p<.05, **p<.01, and ***p<.001

When the effects of type of residence and geographic region were also controlled in model 3, the effect of household economic status on stunting remained large and highly statistically significant. With other factors controlled, children who live in the poorest 20% of households were 79% more likely to be chronically undernourished as those born in the richest 20% of households (OR = 1.79, 95% CI 1.33-2.41 for the poorest 20% of households; OR = 1.61, 95% CI 1.22-2.14 for the next poorest 20% of households; and OR = 1.66, 95% CI 1.27-2.14 for the middle 20% of households). The strong, positive unadjusted association between household wealth status and underweight was diminished and became non-significant when underlying factors were controlled for (Table 4).

Figure 5

Table 4: Effects of household wealth status on underweight (odds ratios and 95% CI; multivariable, multilevel logistic regression models, estimators adjusted for other selected characteristics) among children aged 0 – 59 months, Nigeria 2003

	Model 1	*Model 2*	Model 3
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Measures of association			
Fixed effects			
Wealth status			
Poorest		1.39 (1.00, 1.93)	1.46 (1.00, 2.09)
Poorer		1.26 (0.91, 1.73)	1.31 (0.93, 1.85)
Middle		1.21 (0.88, 1.66)	1.26 (0.90, 1.76)
Richer		1.29 (0.96, 1.72)	1.33 (0.99, 1.78)
Richest		1	1
Child's age (months)		0.98 (0.97, 0.99) **	0.97 (0.96, 0.99) *
Male (versus female)		1.12 (0.97, 1.30)	1.13 (0.98, 1.30)
High birth order (4+)		1.14 (0.93, 1.39)	1.11 (0.91, 1.36)
Breast feeding duration (Months)		1.04 (1.03, 1.06) ***	1.04 (1.03, 1.06) ***
Full immunization		0.87 (0.69, 1.10)	0.92 (0.73, 1.16)
Age (years) of mother at childbirth		0.97 (0.96, 0.99) ***	0.98 (0.96, 0.99) **
Education of mothers			
No education		1	1
Primary		0.94 (0.77, 1.14)	1.02 (0.84, 1.25)
Secondary or higher		0.66 (0.52, 0.85) **	0.73 (0.57, 0.94) *
Occupation of mothers			
Not working		1	1
Manual or agriculture		0.98 (0.82, 1.17)	0.91 (0.73, 1.12)
Professional		0.86 (0.69, 1.07)	0.98 (0.83, 1.17)
BMI (kg/m²) of mothers			
Underweight		1.39 (1.13, 1.70) **	1.36 (1.11, 1.66) **
Normal weight		1	1
Overweight		0.64 (0.51, 0.80) ***	0.66 (0.52, 0.82) ***
Under-five in household (4+)		1.08 (0.88, 1.32)	1.07 (0.87, 1.31)
Community-level factors			
Rural (versus urban)			0.99 (0.78, 1.25)
Geographic region			
North central			0.62 (0.42, 0.91) *
North east			1.08 (0.74, 1.57)
North west			1.33 (0.93, 1.91)
South east			0.66 (0.42, 1.05)
South south			0.84 (0.54, 1.29)
South west			1
Measures of variation			
Community-level variance			
Variance [τ (SE)]	0.47 (0.09) ***	0.24 (0.06) ***	0.16 (0.05) **
VPC (%)	12.5	6.8	4.7
Explained variation (%)	reference	48.9	65.0
Model fit statistics			
-2log likelihood	4942	4796	4770

Abbreviations: VPC-variance partition coefficient; SE-standard error; BMI-body mass index

*$p<.05$, **$p<.01$, and ***$p<.001$

EFFECTS OF OTHER RISK FACTORS AND CONFOUNDERS

Among control variables child's sex had the strongest effect on risk of stunting, and this effect is independent of the economic status and other maternal and household characteristics (Table 3 model 3). With household wealth status and other factors controlled, the child's sex, breastfeeding duration, household size, and mothers' education attainment all have statistically significant effects on risk of stunting. With household wealth status and other factors controlled, the child's age, breastfeeding duration, and mothers' characteristics (age at childbirth, education, and BMI) all have statistically significant effects on risk of underweight.

NEIGHBORHOOD VARIATIONS IN CHILD MALNUTRITION

The result of the random effects models are shown in Table 3 & 4 (Empty Model 1). There are significant variation in the log odds of stunting (τ = 0.43, p = 0.01) and underweight (τ = 0.47, p = .001) across the communities. According to the intra-community coefficient implied by the estimated intercept component variance, 12% of the variance in the stunting and underweight could be attributed to community-level. These variations remained significant, even after controlling for individual-level factors (Model 2) and both individual-level and community-level factors. As judged by proportional change in variance, 62% and 49% of the variance in the log odds of stunting and underweight across communities was explained by individual-level (Model 2) respectively. While 78% and 65% of the variance in the log odds of stunting and underweight across communities was explained by both individual-level factors (Model 2) and community-level factors (Model 3) respectively.

DISCUSSION

MAIN FINDINGS

The results of present study have shown that childhood under-nutrition is a serious problem in Nigerian and have provided evidence of concentration of childhood malnutrition among the poorest households. These findings are consistent with preponderance of evidence from other developing countries and provide further evidence that household economic status is an important determinant of childhood under-nutrition in developing countries [7,25,26,27,30,31,32,33]. Poverty affects child nutritional status through insufficient food intake, greater exposure to infections, and lack of access to vaccinations and basic health care. It is noted that income-related inequalities are the strongest in stunting, an indicator of chronic malnutrition that is often associated with socio-economic deprivation. As expected, no discernible socio-economic inequalities are observed in wasting, as income has a little effect on the stochastic conditions (unforeseen environmental factors and diseases) which usually precipitate wasting [30]. The positive association between wealth index and underweight is considerably diminished and non-significant when underlying factors are taken into account. These results indicate that much of the positive association between and underweight is due to underlying factors.

The study find that child's sex, age, mother's age at birth, mother's height and body mass index are important determinants of a child's nutritional status, which is consistent with the findings of most studies in this literature. A number of studies from Africa suggest that malnutrition among boys is consistently higher than malnutrition among girls [34,35,36,37]. One study obtained in Nigeria reported that younger mothers (teenagers) are less likely in comparison to older mothers to breastfeed their children after birth, which means that the age of the mother at birth of a child influences whether the child will receive colostrums or not, which might affect the nutritional status of children [38]. Consistent with previous studies [39,40,41,42,43], this study finds that mother's education has strong negative effect on child nutritional status, independent of other factors. There is a very large literature from around the world that demonstrates the significance of mother's schooling to lower childhood malnutrition rate. The pathways from mother's schooling lower childhood malnutrition rate include, but are not limited to, greater likelihood of obtaining pre- and ante-natal care, seeking prompt medical care at the first sign of a child's illness, and more appropriate breast feeding and nutritional supplementary practices. In addition, another proxy for household food insecurity, the mother's BMI is negatively and significantly associated with stunting, suggesting that children in a household where the mother has a low BMI are more likely to be stunted. Contrary to expectation, long duration of breastfeeding is associated with higher malnutrition. However, the negative association of long breastfeeding has also been established in the literature [44,45,46,47]. Long duration of breastfeeding may be associated with higher malnutrition because it reflects lack of resources to provide children with adequate nutrition[25].

Of particular interest in this investigation are possible effects of neighbourhood context on childhood malnutrition. Neighbourhoods constitute a key determinant of socioeconomic disparities in health, as they shape individual opportunities and expose residents to multiple risks and resources over the life course. Using multilevel framework, this study that has shown that both individual-level and community-level characteristics are important predictors of childhood malnutrition in Nigeria, and demonstrates significant neighborhood variation in chronic childhood malnutrition. The individual- and community-level characteristics included in the model are able about 50% of these observed variations.

POLICY IMPLICATIONS

The study findings have some important and relevant policy messages. There is a need for scaling up strategies for reducing economic inequality and raising the relative income of the poorest sections of the population, and these could include: (i) the development of relatively poor rural areas, (ii) spreading development to the poorest provinces, (iii) targeting subsidies on consumption, (iv) income and public service fees for those least able to pay, (v) identifying and tackling the demographic and socioeconomic characteristics of especially poor and vulnerable groups, and (vi) designing taxation and pricing policies to help redistribute income from rich to poor. With the models the study is able to explain only half of the neighbourhood variations in childhood malnutrition. These findings have important implications for targeting policy as well as the search for left-out variables that might account for this unexplained variation.

STUDY LIMITATIONS AND STRENGTHS

There are a number of caveats to be considered when interpreting these results. The cross-sectional nature of the data limits ability to draw casual inferences. Another limitation of this study worth mentioning is that measuring wealth is problematic. The study can be criticized for using an indirect measure of household wealth. However, due to the fact that in developing countries like Nigeria it is hard to obtain reliable income and expenditure data, an asset-based index is generally considered a good proxy for household wealth status. Another potential limitation of this analysis is that it does not control for diet and other health care indicators. However, household wealth status functions mainly through better access to food and health care in affecting childhood nutritional status, for example more wealthy households can afford better food in terms of quality. Despite these limitations, the study strength is significant. It is a large, population-based study with national coverage.

CONCLUSION

Using an explicit multilevel analytic framework, the study has demonstrated that household wealth status is an important determinant of chronic childhood malnutrition, and that there is significant neighborhood variation in childhood malnutrition, even after controlling for effects of both individual- and community-level characteristics. Future studies should investigate other factors that may account for the unexplained neighborhood variation in childhood malnutrition. Future research also should address the mechanisms that connect the individual and neighborhood levels, that is, the means through which deleterious neighborhood effects are transmitted to children. These mechanisms are crucial to the design of community-based interventions because these processes are more amenable to change than entrenched structural properties of neighborhoods (e.g., concentrated poverty). Although this study does not investigate these mechanisms, the findings clearly provide evidence that social context is associated with health independent of individual-level health risk factors, challenging a purely individualistic approach to health, and pointing to the importance of health promotion and disease prevention at the community level. Scholars trying to understand variation childhood malnutrition should pay attention to the characteristics of both children and place of residence.

ACKNOWLEDGEMENTS

The author is grateful to ORC Macro International for providing them with the 2003 Nigeria Demographic and Health Survey data.

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