

# Demographic and Social-Economic Determinants of Malnutrition among Children (0-23 Months Old) in Kenya

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**Abstract:** *Objective:* To identify the demographic, social, and economic determinants of malnutrition in Kenya's children aged 0-23 months.

*Methods:* Data from the Kenya Demographic and Health Survey (KDHS), a nationally representative cross-sectional study conducted in 2014/2015, were used in this study. Data from children 0-23 months old with complete information on weight, height, age, and sex were used for analysis. Height for Age Z scores (HAZ), Weight for Height Z scores (WHZ), and BMI for age Z scores (BAZ) was determined using WHO guidelines to determine the nutritional status of the children. Chi-square statistics were used to determine the relationship between social-economic status and place of residence indicators and the nutritional status of the children. Significance was set at  $p < 0.05$ .

*Results:* Among all participating ( $n=7578$ ), 22.7% were stunted ( $HAZ < -2$ ), 6.2% were wasted ( $WHZ < -2$ ), and 6.1% were either overweight or obese ( $BAZ > 2$ ). Wasting and stunting were significantly higher in children from rural areas, poorer wealth index, and mothers with no education. In contrast, children from urban areas, the richest wealth index category, and mothers with secondary or higher education were significantly more likely to be overweight or obese.

*Conclusion:* Current and future policies and programs to curb malnutrition in Kenya need to target specific needs of children based on their social-economic status, area of residence, and other demographic characteristics that were identified as determinants of child malnutrition instead of using a general approach.

**Keywords:** Underweight, stunting, wasting, overweight, obesity, malnutrition, Kenya, Africa.

## INTRODUCTION

Childhood malnutrition is linked to several developmental and health-related challenges. For example, stunting in early childhood is associated with poor physical and mental development, increased susceptibility to infections, increased morbidity and mortality, and increased risk of overweight and obesity in adulthood [1]. Similarly, severe acute malnutrition (SAM) during childhood has shown long-term negative effects on cognitive function resulting in children being less competitive academically as well as having lower self-esteem [2]. In particular, malnutrition during the first 1000 days of life - the period from conception to 2 years - is very critical as this period is considered the most important for neurological development [3]. Several studies in developed countries have shown that poor nutrition in the first 1000 days is associated with obesity and its comorbidities in later life [4, 5].

The determinants of childhood malnutrition are multifaceted and are influenced by individual, household, and community factors. The United Nations Child Education Fund (UNICEF) proposed a framework in 1990 that grouped the determinants of childhood malnutrition into 3 levels, a) immediate causes, b)

underlying causes, and c) Basic causes [6]. The immediate causes are believed to be poor food intake and disease infections such as malaria, diarrhea, and pneumonia. The underlying determinants, mainly observed at the household level, include food insecurity, suboptimal caring capacity for mothers and children, and inadequate access to a safe and healthy environment like clean water and sanitation and health care facilities. At the basic level, these underlying determinates are influenced by resources available to the household and community and how the social, cultural, and political environments influence the distribution of these resources [7]. Many governmental and non-governmental based interventions are designed to mitigate the effects of childhood malnutrition by mainly targeting these determinants at national levels.

While progress has been made in improving the nutritional status of children in Kenya, it is important to note that levels of malnutrition remain high. A recent study showed that stunting, underweight, and wasting in children under the age of 5 years in Kenya decreased by 12, 7, and 3 percentage points respectively between 1998 and 2014 [8]. Studies have identified determinants of undernutrition in sub-Saharan Africa using nationally representative data [9]. The majority of these studies are done on children from birth to 5 years of age. Very few studies have been

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done specifically on children who are within the first 1000 days period despite the known importance of this period. Therefore, this study aimed to identify the determinants of childhood malnutrition in children 0-23 months old in Kenya.

## MATERIALS AND METHODS

### Study Design and Sampling

This was a secondary data analysis of the 2014/2015 Kenya Health Demographic Health Survey (KDHS). KDHS is a nationally representative cross-sectional survey conducted every 5 years to determine the health and demographic characteristics of the population [10]. This survey utilized a cluster multistage sampling method where the primary sampling units were clusters drawn from the NASSEP V (Fifth National Sample Survey and Evaluation Program) master sampling frame. This sampling frame contained 5360 clusters drawn by stratified probability sampling methodology from 96,251 enumeration areas (EAs) in the 2009 Kenya Population and Housing Census. 1612 clusters were selected in the first stage, with 995 and 617 being rural and urban, respectively. In the second stage, 25 households were selected from each cluster, yielding a total of 40,300 households representing Kenya's population. Data were collected from only the preselected households, and no replacement was allowed during data collection. Data were collected using an interviewer-administered questionnaire that was done by trained field staff. The response rate was 99% [10].

### Anthropometric Measurements and Nutritional Status

Nutritional status was determined using weight and height measurements. Weight was measured using an electronic digital SECA scale and was measured to the nearest 100g. Very young children were weighed with their mother, and the scale allowed for automatic elimination of the mother's weight when measured standing on the scale with the child. Height measurements were taken using height/length Shorr boards manufactured by Shorr productions specifically for this study [10]. The recumbent length of children younger than 2 years was taken with children lying on the board. Nutrition specialists from partnering organizations conducted training on collecting anthropometric measurements where the trainees completed a standardization exercise measuring children, which was intended to determine and refine measurement accuracy and precision [10]. Height for

Age Z scores (HAZ), Weight for Height Z scores (WHZ), and BMI for age Z scores (BAZ) was calculated using growth standards determined by the World Health organization in 2006. WHZ, HAZ, and BAZ were coded into wasting, stunting, and overweight/obesity, respectively. Stunting was coded as follows; HAZ scores  $>-1.99$  normal,  $-2.99$ - $-2.00$  moderately stunted, and  $<-3.00$  severely stunted. Wasting was coded as follows; WHZ scores  $>2.00$  overweight,  $-1.99$ - $1.99$  normal,  $-2.99$ - $-2.00$  moderately wasted and  $<-3.00$  severely wasted. Overweight and obesity were coded as follows; BAZ scores  $<-2.00$ - $1.99$ , normal,  $2.00$ - $2.99$  overweight, and  $>3.00$  obese [11].

### Demographic and Social-Economic Variables

Participants were categorized as either rural or urban based on their geographical location during data collection. Wealth index, a proxy for long-term household standard of living, was constructed using household asset data and generated through principal component analysis [10]. Education level was determined by responses to the question on the respondent's highest level of schooling. Literacy levels were determined by the individual's ability to read sentences provided by the interviewers. These standard sentences were written in the 17 main languages in Kenya. Respondents with primary education and lower were asked to read the sentences in languages they were most familiar with, and those with secondary and higher were assumed to be literate [10].

### Data Analysis

Data were analyzed using IBM SPSS statistics 26. Descriptive statistics were used to determine the characteristics of the children and households used for this analysis. To determine the disparities between the social-economic variables and nutrition status, chi-square statistics were used. Significance was set at  $p < 0.05$ .

## RESULTS

A total of 7,578 children aged 0-23 months were included in this study, with 77.5% being 6-23 months old. The majority were rural residents (68.5%) and were in the poor and poorest wealth index categories (56%). About 27.5% of the children came from households where the mother or caretaker was considered illiterate as they could neither read nor write. In addition, about 21.4% of the mothers or caretakers had no formal education. About 22.7%,

**Table 1: Demographic Characteristics of the Participants (n=7578)**

	Characteristic	n	%
Residence	Urban	2384	31.5
	Rural	5194	68.5
Education level	No education	1618	21.4
	Primary	3919	51.7
	Secondary	1535	20.3
	Higher	506	6.7
Household head	Male	5415	71.5
	Female	2163	28.5
Literacy	Cannot read at all	2078	27.5
	Able to read-only parts of sentence	742	9.8
	Able to read whole sentence	4733	62.6
	No card with required language	3	0
	Blind/visually impaired	10	0.1
Wealth index	Poorest	2689	35.5
	Poorer	1563	20.6
	Middle	1251	16.5
	Richer	1106	14.6
	Richest	969	12.8
Sex of child	Male	3841	50.7
	Female	3737	49.3
Nutritional status	Stunting	1717	22.7
	Wasting	476	6.2
	Overweight	366	4.8
	Obese	100	1.3

6.2%, 4.8%, and 1.3% were stunted, wasted, overweight, and obese, respectively. More descriptive characteristics of the participants are presented in Table 1.

The highest proportion of stunting was found among children from rural residences (16.7% moderate and 7.8% severe) as compared to urban residences (12.3% moderate and 6.5% severe%) ( $p < 0.0001$ ). Similarly, wasting was significantly higher in children from rural (4.7% moderate and 1.8% severe) as compared to urban (4.1% moderate and 1.6% severe) ( $p = 0.019$ ). In contrast, overweight and obesity were higher in urban residents (7.5%) as compared to rural residents (5.5%) ( $p = 0.006$ ), as shown in Table 2.

As compared to children from poorer and poorest quintiles, those from a household of higher quintiles of wealth indices (richer and richest) had lower percentages of moderate and severe stunting (18.9%

and 12.4% vs. 27.8% and 25.1%) ( $p < 0.0001$ ) and moderate and severe wasting (4.5% and 4.1% vs. 8.0% and 4.6%) ( $p < 0.0001$ ). However, more children were overweight and obese in the richer and richest categories compared to the poor and poorer wealth index categories ( $p < 0.0001$ ). A full description of the relationship between wealth index and child nutrition status is shown in Table 3.

Significant differences were found between the nutritional status of children and the educational level of the household head. Children from household heads with secondary education and higher were less likely to be severely stunted than children from households with primary education or no education at all (5.2% and 3.8% vs. 8.2% and 8.4%). Similarly, a higher proportion of children who were wasted were from households where the heads had no education primary education. On the contrary, overweight and obesity were

**Table 2: Relationship between the Place of Residence (Urban vs. Rural) and Childhood Malnutrition in Children 0-23 Months Old in Kenya**

		Urban n (%)	Rural n (%)	$\chi^2$	P-value
Stunting	Normal weight	1935 (81.2)	3926 (75.6)	30.21	<0.0001
	Moderate stunting	293 (12.3)	865 (16.7)		
	Severe stunting	156 (6.5)	403 (7.8)		
Wasting	Normal weight	2070 (86.8)	4561 (87.8)	9.99	0.019
	Moderate stunting	98 (4.1)	246 (4.7)		
	Severe stunting	39 (1.6)	93 (1.8)		
	Overweight	177 (7.4)	294 (5.7)		
BMI for age	Normal weight	2081 (87.3)	4608 (88.7)	14.31	0.006
	Overweight	137 (5.7)	229 (4.4)		
	Obese	43 (1.8)	57 (1.1)		
	Underweight	123 (5.2)	300 (5.8)		

**Table 3: Relationship between Wealth Index and Childhood Malnutrition in Children 0-23 Months Old in Kenya**

		Poorest n (%)	Poorer n (%)	Middle n (%)	Richer n (%)	Richest n (%)	$\chi^2$	P
Stunting	Normal weight	1940 (72.1)	1170 (74.9)	1005 (80.3)	897 (81.1)	849 (87.6)	130.00	<0.0001
	Moderate stunting	485 (18.0)	283 (18.1)	170 (13.6)	133 (12.0)	87 (9.0)		
	Severe stunting	264 (9.8)	110 (7.0)	76 (6.1)	76 (6.9)	33 (3.4)		
Wasting	Normal weight	2355 (87.6)	1396 (89.3)	1087 (86.9)	972 (87.9)	821 (84.7)	126.72	<0.0001
	Moderate wasting	175 (6.5)	50 (3.2)	53 (4.2)	31 (2.8)	35 (3.6)		
	Severe wasting	66 (2.5)	22 (1.4)	21 (1.7)	14 (1.3)	9 (0.9)		
	Overweight	93 (3.5)	95 (6.1)	90 (7.2)	89 (8.0)	104 (10.7)		
BMI for age	Normal weight	2392 (89.0)	1407 (90.0)	1098 (87.8)	970 (87.7)	822 (84.8)	135.19	<0.0001
	Overweight	73 (2.7)	70 (4.5)	70 (5.6)	76 (6.9)	77 (7.9)		
	Obese	13 (0.5)	21 (1.3)	19 (1.5)	18 (1.6)	29 (3.0)		
	Underweight	211 (7.8)	65 (4.2)	64 (5.1)	42 (3.8)	41 (4.2)		

**Table 4: Relationship between Education Status and Childhood Malnutrition in Children 0-23 Months Old in Kenya**

		No education n (%)	Primary n (%)	Secondary n (%)	Higher n (%)	$\chi^2$	P-value
Stunting	Normal weight	1224 (75.6)	2944 (75.1)	1260 (82.1)	433 (85.6)	55.78	<0.0001
	Moderate stunting	262 (16.2)	647 (16.5)	195 (12.7)	54 (10.7)		
	Severe stunting	132 (8.2)	328 (8.4)	80 (5.2)	19 (3.8)		
Wasting	Normal weight	1373 (84.9)	3492 (89.1)	1340 (87.3)	426 (84.2)	165.14	<0.0001
	Moderate wasting	134 (8.3)	142 (3.6)	56 (3.6)	12 (2.4)		
	Severe wasting	54 (3.3)	59 (1.5)	16 (1.0)	13 (0.6)		
	Overweight	57 (3.5)	226 (5.8)	123 (8.0)	65 (12.8)		
BMI for age	Normal weight	1405 (86.8)	3520 (89.8)	1343 (87.5)	421 (83.2)	191.12	<0.0001
	Overweight	36 (2.2)	168 (4.3)	106 (6.9)	56 (11.1)		
	Obese	13 (0.8)	41 (1.0)	31 (2.0)	15 (3.0)		
	Underweight	164 (10.1)	190 (4.9)	55 (3.6)	14 (2.8)		

**Table 5: Relationship between Literacy Status and Childhood Malnutrition in Children 0-23 Months Old**

		Cannot read at all n (%)	Only parts of sentence n (%)	Whole sentence n (%)	*No card n (%)	Blind/visually impaired n (%)	X <sup>2</sup>	p-value
Stunting	Normal weight	1545 (74.4)	549 (74.0)	3746 (79.1)	2 (66.7)	9 (90.0)	30.57	<0.0001
	Moderate stunting	346 (16.7)	124 (16.7)	685 (14.5)	1 (33.3)	1 (10.0)		
	Severe stunting	187 (9.0)	69 (9.3)	302 (6.4)	0 (0.0)	0 (0.0)		
Wasting	Normal weight	1779 (85.6)	649 (87.5)	4185 (88.4)	1 (33.3)	8 (80.0)	159.10	<0.0001
	Moderate wasting	157 (7.6)	30 (4.0)	152 (3.2)	2 (66.7)	1 (10.0)		
	Severe wasting	66 (3.2)	11 (1.5)	54 (1.1)	0 (0.0)	1 (10.0)		
	Overweight	76 (3.7)	52 (7.0)	342 (7.2)	0 (0.0)	0 (0.0)		
BMI for age	Normal weight	1813 (87.2)	661 (89.1)	4197 (88.7)	1 (33.3)	8 (80.0)	152.59	<0.0001
	Overweight	56 (2.7)	35 (4.7)	275 (5.8)	0 (0.0)	0 (0.0)		
	Obese	15 (0.7)	11 (1.5)	73 (1.5)	0 (0.0)	0 (0.0)		
	Underweight	194 (9.4)	35 (4.7)	188 (4.0)	2 (66.7)	2 (20.0)		

\*Respondents were not familiar with any of the 17 languages on the cards.

associated with households with household heads with secondary education and higher. The relationship between education status and nutritional status is summarized in Table 4.

Children from households where the respondent was illiterate or had lower literacy levels had statistically significantly higher undernutrition levels than those with higher literacy levels. For example, severe stunting was found in 9% of children from households with parents or caretakers who could not read or write compared to 6.4% of children from families with parents who could read and write the whole sentences ( $p < 0.005$ ). Overweight and obesity were also more prevalent in children from households where the parents or caretakers with higher literacy levels, as shown in Table 5.

## DISCUSSION

The purpose of this study was to identify the demographic and social-economic characteristics, particularly in the area of residence, wealth status, education, and literacy levels, associated with the nutritional status of children less than 2 years old in Kenya. Children living in households, from rural areas, with lower wealth index, low education attainment, and low literacy levels were found to have a significantly higher prevalence of stunting, wasting, and underweight. In contrast, overweight and obesity, although still low in prevalence among children in this age group, was found to be significantly higher in urban, wealthier, higher education, and higher literacy

level households. Similar findings have been reported in studies using demographic health surveys in developing countries [12] and especially in sub-Saharan African countries [13, 14] among children 0-5 years old.

All indicators of childhood malnutrition except overweight and obesity were significantly higher in rural areas than in urban areas. Previous studies have had conflicting findings on whether the rural-urban effects on child malnutrition persist when other social-economic variables such as education level and income are controlled [15, 16]. Some of these studies found that undernutrition in urban areas remained the same or was higher than in rural areas [17, 18] when other social-economic variables were controlled. The reason children in urban areas tend to show better nutrition outcomes has been attributed to women's higher education status, availability of clean water and sanitation, higher income, and increase in women decision making capability [19], factors that have been shown to positively influence child nutritional status [20-22]. Kimani-Murage *et al.* (2014) found that the gap between urban and rural residence in respect to health outcomes was narrowing, and they attributed this to the majority of urban residents living in informal settlements that have poor access to water and sanitation, job opportunities, and inadequate health services [23]. Therefore, the place of residence may not independently influence the nutritional status of children when other factors such as education level and wealth status are put into consideration.

The wealth index is a composite measure of a household living standard, and it is used in countries where reliable measurements of income and expenditure that can be used to estimate household economic status are missing. Household assets, nature of materials used for housing, and access to water and sanitation facilities variables are used to derive the wealth index using the methodology proposed by Filmer and Pritchett [24]. Therefore, children from households with a higher wealth index are expected to have better nutrition status, which has been reported in many studies worldwide [17, 25, 26]. Tasmin *et al.* (2017), in their study, reported that lack of water availability, lack of latrine in the home, and poor roofing materials were associated with increased odds of being underweight in children (OR: 5.00, 2.70 and 4.00 respectively) [27]. Households with a higher wealth index are more likely to have a higher education status of the household members because education enhancement leads to better job placement and hence higher income.

Educational level and literacy status, although closely related, were measured independently in this study. Respondents who had secondary education or higher were considered literate, and literacy level was then measured in those reporting to have primary education or lower. Many studies have highlighted the importance of maternal education level on the nutritional status of children, especially children 5 years and younger [28, 29]. Women with higher education levels are likely to have more income, be more food secure, and have access to sufficient health care for their children [30]. We can therefore anticipate that this was the case in this study.

Strategies to reduce malnutrition in children in Kenya are based on the Sustainable Development Goals (SDGs) agreed on by the United Nations in 2015 [31]. Specifically, programs and projects target SDGs such as poverty and hunger eradication, improved education quality, improved health quality, clean water and sanitation, and reduction in inequalities. In Kenya, significant progress has been made at the policy level in working towards achieving the SDGs through developing the Kenya Vision 2030 blueprint [32]. However, the impacts of these projects at household and individual levels are yet to be documented. Policymakers and researchers need to start publishing the impacts of these interventions on childhood nutritional status so that governments and their

development partners can make more informed decisions on where to spend most of their resources.

The main strength of this study was the use of nationally representative data that ensured equal representation of the Kenyan population. However, there were few limitations in the study. First, this was secondary data analysis, and therefore not all variables of interest were available for analysis. Another limitation is that the data was collected in 2014, which is a little dated considering the current COVID -19 pandemic that may have modified some of the determinants discussed here. However, this was the most recent data set available that is nationally representative. Future studies need to use more current data that may reflect recent changes that could have occurred and the impact of the COVID-19 pandemic on the progress in improving the nutritional status of children in Kenya.

## CONCLUSION

Although improvements in the nutritional status of children in Kenya have been observed, levels of undernutrition especially stunting, remain high. Many studies focus on children 0-5 years old, and only a few give attention to the subgroup within the first 1000 days of life (0-23 months). Therefore, this study sought to focus on that age group. It was found that children (0-23 months old) from rural residences and households with lower social-economic status were more likely to be undernourished than their counterparts from urban residences and higher social, economic status households. Several programs and projects have been initiated to improve the nutritional status of children in Kenya at the policy level. However, data regarding the impact of these interventions on reducing malnutrition in children at the household or individual level is still scarce. Future studies should look at the reach and impact of government and non-governmental interventions on children's nutritional status based on their demographic and social-economic characteristics. This then will inform researchers and policymakers on where to input more resources to continue decreasing the levels of childhood malnutrition in Kenya.

## ETHICS APPROVAL

Not required as this was a secondary data analysis.

## CONFLICT OF INTEREST

No conflict of interest to report.

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