

MATERNAL CHARACTERISTICS AND CHILD NUTRITIONAL STATUS IN LIBERIA

Abstract

Many Liberian children suffer the burden of malnutrition. Studies have revealed its consequences on children may be severe and irreversible with long lasting implications on those who suffer malnutrition in early childhood. Mothers are known to be the main providers of primary care to children, thus understanding the contribution of maternal characteristics on child nutrition is key towards addressing the problem. This paper examines the role of maternal socio-demographic characteristics on nutritional status of children measured by stunting, wasting and underweight. Analysis of DHS (2007) data indicated almost a third of children were chronically undernourished, a fifth underweight whilst six percent was acutely undernourished. This is significantly high by Sub Saharan Africa standards. Significant determinants of nutritional status were region of residence, age and sex of child, wealth and migration status during the war. Efforts should address enhancing women's status in meeting the Millennium Development Goals.

Introduction

Over the past years, the proportion of the world's people who are hungry has declined from one-fifth to one-sixth, and the absolute number of hungry people has fallen slightly. Over 852 million people are still chronically or acutely malnourished. Though most of them are in Asia, particularly India (221 million) and China (142 million), these regions have contributed to the decline but sadly, Sub-Saharan Africa has 204 million hungry children and is the only region of the world where the prevalence of both general undernourishment and children's underweight status are increasing. If current trends continue, this region will not only fail to achieve the Hunger Goal, but it is likely to suffer from increasing numbers of hungry people (Sanchez *et al*, 2005). Malnutrition amongst children is most widespread among disadvantaged populations living in developing countries. The consequences of malnutrition are severe and long-lasting. Children who are malnourished have longer and more severe illnesses (Black *et al*, 1984; Sepulveda *et al*, 1988) and have a higher risk of dying (Pelletier, 1994; Schroeder and Brown, 1994), compared to better-nourished children. Malnourished children also have delayed motor development (Pollitt *et al*, 1994) and lower cognitive function and school performance (Pollitt, 1990). In adulthood, individuals who were malnourished as children have impaired work capacity (Haas *et al*, 1995) and worse reproductive performance (Martorell *et al*, 1996). Finally, malnutrition can have negative effects, not only on those afflicted, but on their offsprings as well (Ramakrishnan *et al*, 1999). The causes of malnutrition are numerous. These causes are intertwined with each other and are hierarchically related. The most immediate (or proximate) determinants of malnutrition are poor diet and illness (UNICEF, 1998). Poor diet and illness are themselves caused by a set of underlying factors that include family access to food and maternal care-giving practices. Finally, these underlying factors are influenced by the basic socioeconomic and political conditions within which poor families are attempting to raise well-nourished children.

Grey areas exist for many country specific studies on this very topic, more especially in war torn countries in Africa such as Liberia. Even though the crisis of war has ended and the first steps towards reconstruction have been made, the challenges are enormous. Indicators of

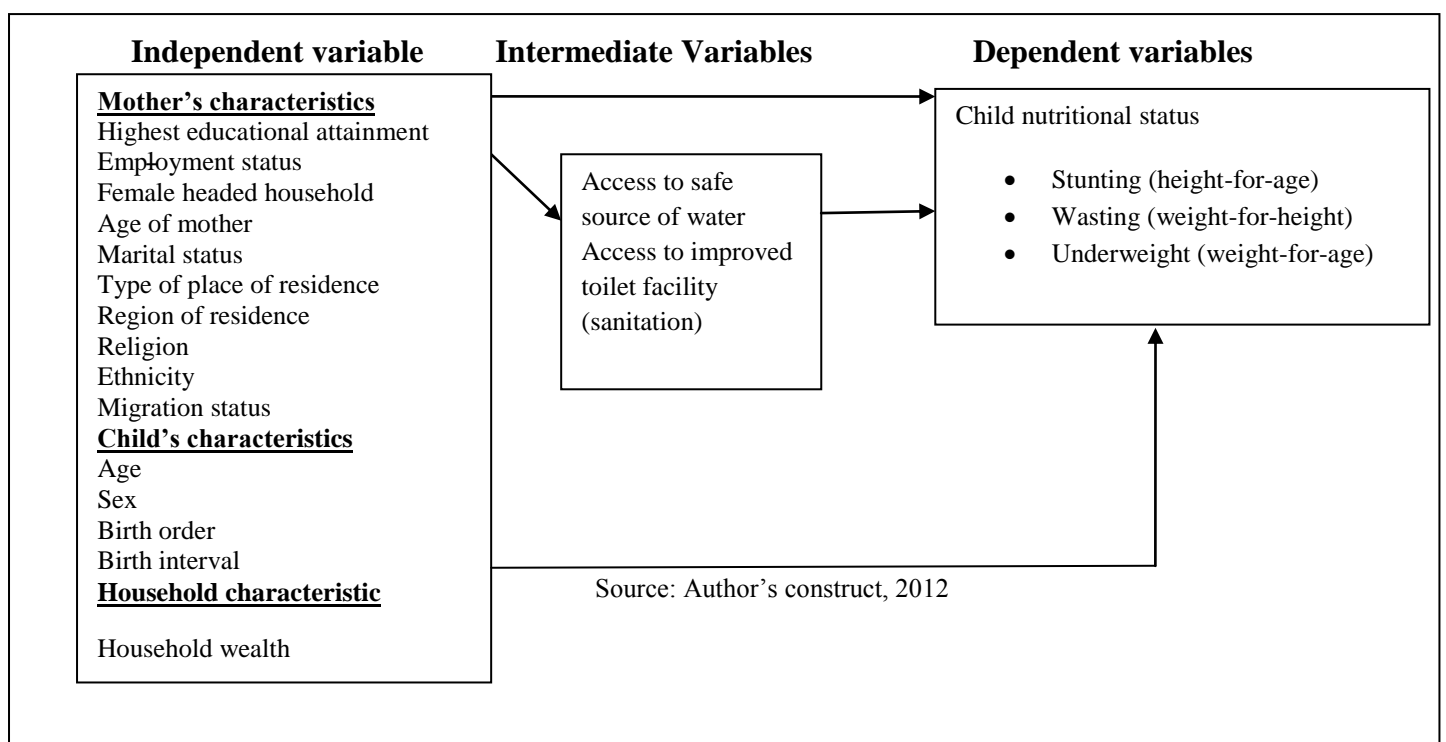
human development in Liberia covering employment, income, health, education, gender equality and child welfare, are amongst the lowest in the world, when such indicators have been available. Yet these indicators are very vital determinants of child health and survival. With mothers being the primary caregivers of children, which characteristics of Liberian mothers, given their present post-war circumstances, promote or undermine their children's health? How can they be addressed as a first step in improving their children's health outcomes, as part of efforts in rebuilding of post-war Liberia?

A review of available literature suggests that the significance of the relationships between maternal demographic and socioeconomic characteristics and children's nutritional status vary from country to country, making it difficult to generalise findings of one location to all other locations, thus making it imperative to fill the gaps in research on this topic for very country specific reasons. Differences exist between countries along numerous traits, cultural and social characteristics. The association between maternal demographic and socioeconomic characteristics and children's nutritional status may not be resilient across residential contexts and may be highly responsive to variations in other contextual factors. An accurate understanding of the relationships among these various causes of malnutrition and the relative contribution of each is essential for the design of efficient and effective intervention programs to reduce malnutrition and its consequences. Because the resources directed at improving nutritional status are relatively scarce, it is critical that these resources are directed at interventions that will have the largest impact and will lead to lasting improvements. Thus, this study focuses on examining the role of maternal characteristics, mainly mother's educational attainment, on nutritional status of Liberian children to help enhance Liberia's capacity building and thus, human development.

Conceptual Framework

Following from reviewed literature, Figure 1.0 is a conceptual framework of this study.

Fig. 1.0 MATERNAL CHARACTERISTICS AND CHILD NUTRITIONAL STATUS: A CONCEPTUAL FRAMEWORK



In many developing countries particularly in Africa, tradition has laid the responsibility of child care on women which begins at conception and continues until infancy, teenage and adulthood (Oyekale and Oyekale, 2000). The implication is that women are key players in the growth and development of a child. In enhancing the quality of care and nutritional status of children, the role of mothers' education is widely recognized. Hobcraft (1993) presented Caldwell's (1979) suggestion regarding the pathways by which mothers' education might enhance child survival other than through enhanced economic status. Education improves the ability of mothers to implement simple health knowledge and facilitates their capacity to manipulate their environment including interaction with medical personnel. The status of women is an important determinant of two resources for care: their physical and mental health status, and control over household resources (Smith and Haddad, 2000). On the other hand, women's control over resources promotes household food security and nutrition because women show a tendency to spend resources on nutrition inputs such as food (Haddad, 1999). Weak control over household resources, tighter constraint on time, restricted access to information and health services, poor mental health, and lack of self confidence and self esteem typically characterize women with relatively lower status which in turn reflect on their children's health and the quality of care provided.

Crepinsek and Burstein (2004) underscored that employment of mothers can have both positive and negative implication on children's dietary intake. On the one hand, the employment of mothers adds to family income and this may help to ensure stable supply of quality food through increased expenditure. On the other hand, mothers' employment may leave them with lesser time for caring and supervision of the activities of their children, and preparation of food. This appears more apparent under the assumption that no care taker would be motivated as a mother would. Access to unsafe water and unsanitary disposal of wastes are regarded as the main causes of infectious diseases such as diarrhoea and intestinal parasites (UNICEF cited in Smith et al, 2005). Where there is a better access to safe water and quality sanitation, the incidence of various illnesses will decline (Smith and Haddad, 2000). Diarrhoea, a major cause of malnutrition, is strongly related to water access and quality, so it is not surprising that water supply and sanitation have been shown to have an effect on nutrition. Undernutrition is in itself a direct indicator of poverty, in the broader definition of the term that includes human development. The prevalence of malnutrition is often two or three times and sometimes many times higher among the poorest income quintile than among the highest quintile. In countries, such as Bangladesh as well as other sub-saharan African countries, where girls' nutrition lags behind, improving the nutrition of young girls adds an extra equity-enhancing dimension to any such investment. Poverty and malnutrition reinforce each other through a vicious cycle. Poverty is associated with poor diets, unhealthy environments, physically demanding labour, and high fertility, which increase malnutrition. Malnutrition in turn reduces health, education, and immediate and future income, thus perpetuating poverty. High parity and short birth intervals are associated with worse child nutrition and maternal nutritional depletion. Family planning affects nutrition both by enhancing maternal resources available to each child and by enhancing women's health. Such programs rarely measure nutrition as an outcome, but a successful family planning program is likely to have a substantial positive effect on nutrition. Thus

maternal health and family planning programs provide another long route to nutritional improvement in children.

Methods of Data Analysis

This study was carried out with secondary data from the 2007 Liberia Demographic and Health Survey (LDHS). This is a survey that meets international standards and thus provides the ability to compare with other similar DHSs. For the purpose of this work, a sample size of 2,961 children under five years of age was used. Their mothers were in the reproductive ages of 15 to 49 years.

The socioeconomic and demographic explanatory variables used in this study are those that are closely related to at least one of the underlying determinants of child nutritional status (household food security, care for children and mothers, household health environment). The dependent variable, child nutritional status, was analysed using three indicators of undernutrition. These were stunting (height-for-age), wasting (weight-for-height) and underweight (weight-for-age). They were expressed as z-scores using the anthropometric measurements of children compared to standards of growth. Each of the indicators was classified under three levels: normal, moderate and severe. WHO standards were used in comparing the deviation of anthropometric z-scores from the median z-score.

In assessing overall quality of the data, the age data of the mothers in this study was evaluated using the Digit Preference Index. There was highest preference for ages ending in 0 and 5. Digits which had least preference or were avoided were 1 and 7. Overall, 12.4% of the mothers misreported their ages. Thus grouping single-year age data usually served to smoothen data, and remove many of the fluctuations in them and as such, the ages of mothers were grouped in 5 and 10-year age groups and used in subsequent analyses.

Examination of selected demographic and socioeconomic characteristics of mothers and their children under five years of age showed that 54% percent of the mothers had no education at all whilst 33.2%, 11.7%, and 0.7% had primary, secondary and higher education respectively. Most of the uneducated were from the rural areas. The implication may be lower statuses of women in Liberia, which may in turn have adverse effects on their children's health statuses. Female headed households constituted only 29% of households in the sample. This may be as a result of the higher incidence of polygynous marriages in sub-saharan Africa compared to their western counterparts. Besides, traditionally men are regarded as the heads irrespective of their status in society. The majority of mothers, 83.7%, were in union (married or were living together) with their partners whereas 7.6% and the mothers had never married. The remaining 8.7% constituted the widowed, separated and divorced. This may suggest that most children were born in marital unions or homes with both parents present. Disparities by religious affiliation reveal that an overwhelming majority of the mothers are Christians. They constitute 85.1% of the total sample. Muslims contributed only 9.9% whereas the least was affiliated to the Traditional religion. However, 4.2% of the mothers reported not belonging to any religion. Religion may contribute to the type of child care- giving practices. Religious beliefs of a parent may influence their children's eating habits through adherence to beliefs, taboos and practices (Awumbila, 2004). Due to the civil war Liberians experienced, internal

displacement and refugee flows was very high, as a means of survival. Almost a third of mothers, 29.7%, left their homes to live in the bush during the war. A considerably high percentage, 26.7%, were internally displaced and stayed with relatives or friends. More than a fifth (22.5%), of mothers crossed national boundaries to reside in another country. 11.4% of the mothers also reported staying at Internally Displaced Camps (IDC's). Those who did not migrate at all constituted only 9.7% of the mothers. In total, over 90% of the children had migrant mothers as against less than 10% non migrants. These migrants may have to ration food due to the limited amount available thus having children with poorer nutrition. It is evident that the proportion of mothers declined as wealth status improved. The highest proportion of mothers, hence their children, belonged to the poorest (27.6%) and poorer (27.2%) wealth quintiles. A comparable proportion (20.2%) was in the middle class. The richest class had the least number of women. Thus, if a mother's wealth is found to have significant effect, then a considerable number of children will have poorer nutritional statuses. More than half of the mothers, and thus their children, belong to the Mande ethnic group. Kruan mothers make up almost a third of the sample and those from the Mel ethnic group are just 7.6% of the total. Americo-Liberians make up the least of 2.5% of mothers. Like religion, one's ethnic disposition can influence their health and that of the family. In Sub-Saharan Africa, some ethnic groups are socially and economically disadvantaged and in need of protection from social injustice and exploitation. The interval between births if short invariably puts the succeeding child especially at a disadvantage in many cases the older sibling as well. It has been found that children born less than 12 months after an earlier birth are more at risk of developing adverse health conditions. Sixteen percent of the sample was first births; only 1% had preceding birth interval of less than 12 months; 11.8% had an interval preceding their birth of 12 to 23 months; 46.1% had a preceding birth interval of between 24 and 48 months and 24.9% had more than 48 months between themselves and their immediate oldest sibling. This distribution gives an indication that for the most part births are quite well spaced in Liberia, despite the very low contraceptive prevalence rate in the country. Of the children sampled, 16.1% were first births; 18.3% were second births; 16.2% were third births; 13.2% were fourth births and 36.2% were fifth or higher order births. This high number of children of fifth or higher birth order gives an indication of the high fertility rate in the country. Birth order may affect nutritional status and health seeking behaviour and caring practices in two ways. On the one hand, women with a first birth may be inexperienced in caring for a child and on the other hand higher order births may increase the strain on household time and other resources, thus putting these children at a disadvantage (Horton, 1988; Pande, 2003). The sex distribution of the children was almost equal with males making up 50.6% of the sample and females making up the remaining 49.4% of the sample. This yields a sex ratio of 1.02 for children under five years of age in Liberia. The effect of sex could be two-way. Some studies have shown gender bias in favour of males, whilst others have shown otherwise. A few others have shown there is no significant relationship between sex and nutritional status. Bias may result in societies which place higher value or have preference for a particular sex over the other. Both the mean and median ages were 29 months and the modal age groups were the 24-35 month and the 36-47 month groups. This reflects a normal distribution of children across the different age groups. The infant age groups together constituted just about a fifth of the total sample of children.

Children in the older age groups are most likely to be worse off as some studies have shown that the nutritional status of a child deteriorates as a child ages, which could be a result of increased exposure to contaminated environment and contagious diseases as a child grows. Appallingly, only 10.4% of the subjects have access to an improved source of toilet facility whilst the remaining 89.6% have access to an unimproved source, including those who do not have any access at all.

Table 1.0 Distribution of Nutritional Status Z-Scores in the Study Population

Measure of Nutritional Status	Height-for-age		Weight-for-age		Weight-for-height	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
z-score categories						
Normal(-1.99 to1.99)	1900	64.2	2284	77.1	2775	93.7
Moderate (-3 to -2)	542	18.3	511	17.3	134	4.5
Severe (< -3)	518	17.5	165	5.6	52	1.8

Source: Computed from LDHS 2007 data

According to the distribution, there are more stunted children than there are underweight or wasted children. More than a third of the children (35.8%) suffer from chronic or long term malnutrition, which is characterised by stunting. This means that more than one out of every three children suffers chronic malnutrition. About a third of the children (22.9%) are underweight. Children who suffer acute or short term malnutrition are relatively smaller. They constitute only 6.3% of the total.

Bivariate Analysis

The bivariate analysis was based on Chi Square test which is presented in tables below. This Chi Square test was performed on categorical socio-demographic characteristics and it allowed the examination of the association between these variables and nutritional status of children.

Table 1.1 Distribution of Stunting by Socioeconomic and Demographic characteristics

Background characteristics	Percent Stunting			Number	Chi-square	p-value
	Normal	Moderate	Severe			
Educational level of mother						
No education	62.9	19.1	18.1	1610	23.61	0.000***
Primary	63.1	17.8	19.1	983		
Secondary	71.7	17.3	11.0	346		
Higher	95.2	0.0	4.8	21		
Current Age of Mother						
15-19	66.9	14.3	18.8	154	2.043	0.731
20-34	64.3	18.3	17.4	1920		
35 and over	63.4	19.0	17.6	888		
Employment Status						
Not employed	61.7	16.5	21.8	303	4.462	0.108
Employed	64.5	18.5	17.0	2657		
Marital Status						
Never married	70.5	13.8	15.6	224	8.313	0.081*
In union	63.5	18.4	18.1	2478		
Widowed/Divorced/Separated	65.5	20.9	13.6	258		
Female Headed Household						
No	63.7	18.1	18.2	2102	2.094	0.349
Yes	65.3	18.7	15.9	859		

Background characteristics	Percent Stunting				Chi-square	p-value
Ethnicity						
Mel	72.3	17.4	10.3	224	17.898	0.007***
Mande	62.2	19.4	18.4	1781		
Kruan (Kwa)	65.0	16.9	18.0	881		
Americo-Liberian	76.0	12.0	12.0	75		
Migrant Status During War						
Did not leave house	64.1	16.4	18.5	287	34.323	0.000***
Lived in bush	59.0	20.7	20.3	879		
Went to camp	66.7	12.5	20.8	336		
Stayed with relatives/friends	69.7	17.1	13.3	791		
Lived outside Liberia	63.3	20.2	16.5	667		
Religion						
Christian	64.5	18.3	17.2	2519	10.194	0.117
Muslim	67.2	15.7	17.1	293		
Traditional	48.0	28.0	24.0	25		
No religion	54.0	23.4	22.6	124		
Type of place of residence						
Urban	73.8	15.6	10.6	652	38.075	0.000***
Rural	61.5	19.1	19.5	2308		
Region of residence						
Monrovia	74.5	15.7	9.8	459	53.043	0.000***
North Western	68.9	18.2	12.9	280		
South Central	67.4	17.5	15.1	445		
South Eastern A	65.0	15.0	20.0	214		
South Eastern B	56.7	20.3	23.0	217		
North Central	59.7	19.6	20.7	1346		
Wealth of Household						
Poorest	60.4	17.2	22.5	815	67.068	0.000***
Poorer	59.9	20.2	20.0	807		
Middle	64.0	20.1	15.9	598		
Richer	69.2	18.8	12.0	483		
Richest	81.6	10.5	7.8	256		
Source of drinking water						
Safe source	67.6	17.3	15.2	1698	21.382	0.000***
Unsafe source	59.7	19.7	20.6	1263		
Type of toilet facility						
Improved facility	76.9	12.3	10.7	308	24.418	0.000***
Unimproved facility	62.7	19.0	18.3	2653		
Age of Child						
Less than 6 months	94.4	4.2	1.4	284	219.300	0.000***
6-11 months	80.8	12.9	6.3	333		
12-23 months	61.6	21.5	16.9	599		
24-35 months	61.1	20.7	18.3	619		
36-47 months	55.8	21.1	23.1	620		
48-59 months	53.6	19.4	27.0	504		
Sex of Child						
Male	60.6	19.7	19.7	1498	17.376	0.000***
Female	67.8	16.9	15.3	1464		
Birth Order						
1 st	58.4	14.7	26.9	476	43.498	0.000***
2 nd	66.0	19.6	14.4	541		
3 rd	63.2	19.0	17.8	478		
4 th	70.2	15.1	14.8	392		
5 th or higher	64.2	20.0	15.8	1073		
Birth Interval						
First birth	58.5	14.6	26.9	480	60.577	0.000***
Less than 12 months	40.0	33.3	26.7	30		
12-23 months	57.1	22.0	20.9	350		
24-47 months	66.0	19.4	14.5	1327		
48 months or more	68.6	16.4	15.0	775		

Note: ***, ** and * refer to 1 percent, 5 percent and 10 percent significance level respectively

Table 1.2 Distribution of Underweight by Socioeconomic and Demographic characteristics

Background characteristics	Percent Underweight				Chi-square	p-value
	Normal	Moderate	Severe	Number		
<i>Educational level of mother</i>						
No education	76.3	18.2	5.5	1610	15.905	0.016**
Primary	75.8	17.9	6.3	983		
Secondary	83.2	12.4	4.3	346		
Higher	100	0.0	0.0			
<i>Current Age of Mother</i>						
15-19	71.2	20.3	8.5	153	13.692	0.008***
20-34	75.8	18.4	5.7	1919		
35 and over	81.1	14.2	4.7	888		
<i>Employment Status</i>						
Not employed	75.9	18.5	5.6	303	0.360	0.831
Employed	77.3	17.1	5.6	2657		
<i>Marital Status</i>						
Never married	78.6	14.7	6.7	224	6.146	0.186
In union	76.6	17.6	5.8	2479		
Widowed/Divorced/Separated	80.9	16.3	2.7	257		
<i>Female Headed Household</i>						
No	76.4	18.3	5.2	2101	6.659	0.036**
Yes	78.9	14.7	6.4	858		
<i>Ethnicity</i>						
Mel	80.8	16.1	3.1	224	5.832	0.442
Mande	77.1	17.3	5.6	1781		
Kruan (Kwa)	76.2	17.3	6.5	880		
Americo-Liberian	77.3	20.0	2.7	75		
<i>Migrant Status During War</i>						
Did not leave house	74.6	18.8	6.6	287	11.971	0.152
Lived in bush	75.7	17.6	6.7	879		
Went to camp	75.9	20.2	3.9	336		
Stayed with relatives/friends	79.6	14.8	5.6	790		
Lived outside Liberia	78.0	17.5	4.5	667		
<i>Religion</i>						
Christian	77.0	17.3	5.7	2519	4.051	0.668
Muslim	79.9	15	5.1	293		
Traditional	80	20	0	25		
No religion	73.4	21	5.6	124		
<i>Type Of Place of Residence</i>						
Urban	80.8	14.4	4.8	652	6.389	0.040**
Rural	76.1	18.1	5.8	2308		
<i>Region of Residence</i>						
Monrovia	81.4	14.0	4.6	458	17.584	0.060*
North Western	82.1	15.7	2.1	280		
South Central	76.8	16.7	6.5	444		
South Eastern A	73.4	19.2	7.5	214		
South Eastern B	75.0	18.1	6.9	216		
North Central	75.8	18.5	5.7	1346		
<i>Wealth of Household</i>						
Poorest	73.9	18.9	7.2	816	32.363	0.000***
Poorer	75.6	18.4	6.1	806		
Middle	75.6	19.1	5.4	598		
Richer	81.8	14.5	3.7	483		
Richest	87.9	9.3	2.7	257		
<i>Source of Drinking Water</i>						
Safe source	79.7	15.7	4.6	1698	16.866	0.000***
Unsafe source	73.6	19.5	7.0	1264		
<i>Type of Toilet Facility</i>						
Improved facility	83.4	11.7	4.9	307	8.095	0.018**
Unimproved facility	76.4	17.9	5.7	2653		

Background characteristics	Percent Underweight				Chi-square	p-value
Age of Child						
Less than 6 months	98.2	1.8	0	284	96.365	0.000***
6-11 months	77.2	17.1	5.7	334		
12-23 months	70.2	21.5	8.3	600		
24-35 months	73.3	20.8	6.0	621		
36-47 months	78.2	16.3	5.5	6.9		
48-59 months	77.0	17.9	5.2	504		
Sex of Child						
Male	75.8	19.0	5.1	1498	6.954	0.035**
Female	78.5	15.5	6.0	1463		
Birth Order						
1 st	70.2	18.9	10.9	477	35.356	0.000***
2 nd	77.3	17.6	5.2	541		
3 rd	77.2	17.6	5.2	478		
4 th	78.9	17.8	3.3	393		
5 th or higher	79.4	16.0	4.6	1073		
Birth Interval						
First birth	69.8	19.4	10.8	480	71.968	0.000***
Less than 12 months	53.3	26.7	20.0	30		
12-23 months	69.7	24.9	5.4	350		
24-47 months	80.0	16.0	4.1	1327		
48 months or more	81.0	14.5	1.2	775		

Note: ***, ** and * refer to 1 percent, 5 percent and 10 percent significance level respectively

Table 1.3 Distribution of Wasting by Socioeconomic and Demographic characteristics

Background characteristics	Percent Wasting				Chi-square	p-value
	Normal	Moderate	Severe	Number		
Educational level of mother						
No education	94.2	4.2	1.7	1609	5.677	0.424
Primary	93.4	5.1	1.5	984		
Secondary	92.2	4.9	2.9	346		
Higher	100	0.0	0.0	21		
Current Age of Mother						
15-19	94.8	3.9	1.3	153	4.627	0.328
20-34	93.3	5.1	1.6	1920		
35 and over	94.4	3.5	2.1	888		
Employment Status						
Not employed	96.0	4.0	0	303	6.634	0.045**
Employed	93.5	4.6	2.0	2657		
Marital Status						
Never married	91.1	6.7	2.2	224	7.298	0.112
In union	93.6	4.6	1.8	2479		
Widowed/Separated/Divorced	96.9	2.3	0.8	258		
Female Headed Household						
No	93.8	4.5	1.7	2101	0.348	0.859
Yes	93.5	4.5	2.0	859		
Ethnicity						
Mel	94.7	4.0	1.3	225	11.735	0.054*
Mande	94.6	3.7	1.7	1781		
Kruan (Kwa)	91.4	6.5	2.2	881		
Americo-Liberian	96.0	4.0	0	75		
Migrant Status During War						
Did not leave house	93.4	4.9	1.7	287	13.814	0.086*
Lived in bush	94.9	3.4	1.7	880		
Went to camp	96.1	3.6	0.3	336		
Stayed with relatives/friends	91.9	6.1	2.0	791		
Lived outside Liberia	93.1	4.5	2.4	668		
Religion						
Christian	93.4	4.7	1.9	2519	5.041	0.469
Muslim	96.2	3.1	0.7	293		
Traditional	100	0	0	25		
No religion	91.9	5.6	2.4	124		

Background characteristics	Percent Wasting				Chi-square	p-value
	Normal	Moderate	Severe	Number		
Type of Place Of Residence						
Urban	92.6	5.1	2.3	652	1.846	0.398
Rural	94.0	4.4	1.6	2309		
Region of Residence						
Monrovia	92.6	4.8	2.6	459	21.659	0.016**
North Western	96.1	3.9	0	279		
South Central	91.2	6.7	2.0	445		
South Eastern A	93.9	5.1	0.9	214		
South Eastern B	90.7	6.5	2.8	216		
North Central	95.0	3.3	1.6	1345		
Wealth of Household						
Poorest	93.5	5.1	1.3	816	10.096	0.256
Poorer	94.2	4.1	1.7	806		
Middle	91.7	5.5	2.8	599		
Richer	95.2	3.3	1.4	483		
Richest	94.9	3.9	1.2	257		
Source of Drinking Water						
Safe source	93.8	4.5	1.7	1697	0.053	0.997
Unsafe source	93.7	4.5	1.8	1263		
Type of Toilet Facility						
Improved facility	94.8	2.9	2.3	308	2.447	0.324
Unimproved facility	93.6	4.7	1.7	2653		
Age of Child						
Less than 6 months	97.5	2.1	0.4	284	89.495	0.000***
6-11 months	87.4	9.9	2.7	334		
12-23 months	88.1	8.2	3.7	599		
24-35 months	94.5	3.5	1.9	620		
36-47 months	97.1	2.6	0.3	619		
48-59 months	97.2	1.6	1.2	504		
Sex of Child						
Male	93.7	4.3	2.0	1498	1.000	0.607
Female	93.7	4.7	1.6	1463		
Birth Order						
1 st	94.8	4.2	1.0	477	15.915	0.044**
2 nd	95.2	2.6	2.2	541		
3 rd	93.7	4.6	1.7	478		
4 th	90.6	7.7	1.8	392		
5 th or higher	93.6	4.5	2.0	1073		
Birth Interval						
First birth	94.8	4.2	1.0	480	10.197	0.251
Less than 12 months	93.3	6.7	0.0	30		
12-23 months	92.6	4.0	3.4	351		
24-47 months	93.8	4.3	1.9	1327		
48 months or more	93.2	5.4	1.4	776		

Note: ***, ** and * refer to 1 percent, 5 percent and 10 percent significance level respectively

Discussion

In this study, a mothers' educational attainment has been found to have a positive correlation with the nutritional status of children. The Chi square test showed that there was an association between mother's education and chronic undernutrition or stunting and underweight status amongst their children but not significantly associated with acute or short term undernutrition. Examination of tables 1.1 and 1.2 reveals that the higher a mother's educational attainment, the better the long-term nutritional status of her child. The relationship appears to be a linear one. This means that mothers with no education have children with the worst statuses but this improves progressively as mothers gain higher levels

of education. There were no children in the study sample who were underweight or wasted whose mothers had acquired higher education. In contrast however, mothers with primary education had the least proportion of wasted children followed by those with no education and then with mothers with secondary and higher education having children worse off than the other two categories. This observation is quite unexpected since theoretically education of a mother is supposed to make a child better off in terms of nutrition (Khasnobis and Hazarika, 2006; El Deeb *et al*, 1995; Cerdena *et al*, 1998). It is possible though that other socioeconomic factors associated with nutritional status caused this and the multivariate analysis to be done later will be best used to come to a conclusion on this observation. Age of the mother was found to be of no significance for both chronic and acute malnutrition at Chi square test less than 0.05 thus the null hypothesis was therefore accepted. It was found to be significant only with underweight status. This relationship seems to be a linear one. From Table 1.2, the percentages in the three underweight categories decrease progressively from teenage ages through to older ages. This implies that as mother's age increases, the better the nutritional status of their children. This may stem from the fact that as a mother gains more maturity, she is able to take better care of her child and also engage in a higher income generating venture which is in contrast to a teenage mother who may be a dependant or a school dropout. This is supported by several studies including Khasnobis and Hazarika (2006) who investigated women's Status and children's food security in rural Pakistan and found out that as age of the mother increases so does their children's status especially in the young adult ages. A mother's present work status was found only to influence the weight-for-height nutritional status at the 95% significance level. Working mothers tended to have wasted children as against non-working mothers. Surprisingly, none of the unemployed mothers had severely wasted children. This is in contrast to findings by Senauer and Garcia (1991) and others who reported that the nutritional status of children of working mothers was better than that of those with non-working mothers. But Oppong (2004) has also suggested that those non-working mothers have more time for their children and can take better care of them, thus supporting the findings here. Since wasting is a short term condition from which children can recover from, it is also possible that they had suffered some illness such as diarrhoea or malaria at the time of the survey. Wealth quintile as a measure of household economic status was found to be of significance for both chronic malnutrition and underweight at Chi square test less than 0.05 thus the null hypothesis was therefore rejected. This relationship seems to be a linear one. From the tables 1.1 and 1.2, the percentages in the three underweight categories keep decreasing progressively from poorest through to richest households. This implies that as a household's economic condition improves, the better the nutritional status of their children. This finding is in agreement with Olaniyan (2002), who studied the effects of household resources and community factors on child health in Nigeria. A child being male or female was found to be an important determinant of their nutritional status. This was found to be significant for both chronic and underweight statuses. Females had better statuses than males in both cases. This is known as nutritional insult. There has been evidence of a better nutritional status of female children compared to males in several studies (Moussa *et al*, 1995; El –Sayed *et al*, 2001; Marcoux, 2002). Particularly, boys tend to be at higher risk of being stunted. Particularly, this gender differential in stunting is significant among the poor household. These findings are in conformity to findings of

Wamani *et al* (2004) about Ugandan children. Nutritional insult has been attributed to differing care –giving practices based on society’s preference for a particular sex of child. Children’s age was found to be significantly associated with all three nutritional status indicators at the 95% significant level. Children less than 6 months old had better statuses than all the older children. However at ages 6-11 months, their statuses began to deteriorate until about ages 36 months and older. Children who are being breastfed exclusively (0-6 months) are expected to get all necessary nutrients and increased immunity from breast milk. As a result of this, children under six months of age, if their mothers are following recommendations of the World Health Organization and health personnel, should hypothetically have the best nutritional status compared to older children. At these ages too, they benefit from exclusive care and attention and are less exposed to harmful environmental and pathogenic elements (WHO, 2005). There was a significant relationship between birth order and height for age nutritional status as well as weight for age nutritional status and weight for height. Contrasting to most literature, the higher the birth order of the child, the lower the proportion stunted and underweight tended to be. This finding contradicts what was found by Horton (1998) in the Philippines and Pande (2003) in India. There was also a significant relationship between birth interval and height for age nutritional status as well as weight for age nutritional status but not weight for height. The distribution reflected a linear relationship. The shorter the birth interval of the child, the higher the proportion stunted tended to be and the higher the proportion underweight as well. Children who were first births, thus no birth interval, tended to be better-nourished than those with less than 12 months preceding birth interval. However, they were worse off than children with an interval of over 48 months. This may be due to the relative inexperience of mothers of first children compared with mothers who had experienced several births. This was also found by Winikoff (1983) to be true. It was found that high parity and short birth intervals are associated with worse child nutrition and maternal nutritional depletion. Family planning affects nutrition both by enhancing maternal resources available to each child and by enhancing women’s health. This finding suggests that a well planned family contributes to the wellbeing of children. A mother’s household health environment which was captured in this study as having access to safe source of drinking water as opposed to unsafe source and having access to improved toilet facility as opposed to unimproved facility was found to have a significant relationship with stunting and underweight status of their children. More children from households with poorer sanitary conditions were found to be stunted and underweight. This finding is supported by Smith and Haddad (2000) who found out that where there is a better access to safe water and quality sanitation, the incidence of various illnesses declined. Diarrhoea, a major cause of malnutrition, is strongly related to water access and quality, so it is not surprising that water supply and sanitation have been shown to have an effect on nutritional status. Region of residence of the mother and child was found to be of significance in relation to the child’s nutritional status. Children from Monrovia had the least proportions of stunting, underweight and wasting whereas children from South Eastern B were worse off. Typically, Monrovia being the capital city has much better infrastructure and amenities compared to other regions in the country. It is not surprising that children from the South Eastern parts suffered undernourishment because according to Mulikita (2004), these parts suffered the heaviest destruction during the war. It was also evident that urban-rural

disparities exist in the distribution of undernourished children. However, the gap was not as profound as other studies have shown. The type of place of residence was found to be significant at 95% level for chronic malnutrition and underweight. For instance, the prevalence rate of stunting in rural Liberia was significantly higher than that of urban areas. Similar patterns explain the situation with regard to wasting and underweight. This is in conformity with studies by Smith *et al* (2005) who investigated why child malnutrition is lower in urban than in rural areas using evidence from 36 developing countries. In the previous chapter, it was shown that higher socioeconomic status was characteristic of urban dwelling mothers as compared to their rural counterparts. Due to the synergistic effect of these socioeconomic indicators, it is no doubt that urban children are better off.

The conditions a mother may have faced during the war, away from the place they have always known as home was hypothesised to have adverse effect on their child's nutritional outcome. Their status as a migrant or not for the thirteen years of civil war was found to have a significant effect on the long and short term nutritional status of children. From the tables above it can be seen that for both measures the percentages in the different nutritional status categories keep fluctuating for the type of place they had resided at. However, on the whole, those who lived in the bush had a higher proportion of undernourished as compared to non-migrants followed by those who stayed at internally displaced people's camps (IDP's). Mothers and children who stayed with relatives or friends or who crossed national boundaries to other neighbouring countries had better statuses. Available information shows that Liberia remains among the most food insecure countries in the world. The food problem was most pronounced in rural areas and IDP camps. According to the 2004 Consolidated Appeal Process for Liberia, at least 300,000 people were given food assistance in several camps in order to cope with the food crisis. This was in addition to the provisions given to displaced Liberians who were residing with relatives and friends in Monrovia and its environs. During the first half of the civil conflict (1989-1996) the country relied heavily on humanitarian food aid. Food production declined to about 20 per cent of the pre-conflict era. This accounted for increases in infant and maternal mortality and widespread malnutrition (Human Development Report, 2004).

Multivariate Analysis

In this study, child nutritional status, the dependent variable, was classified under three conditions. Each of these was measured in three levels, that is, normal (-1.99 to 1.99 standard deviation from standard median), moderate (-2 to -2.99 sd) and severe (-3 to -5.99) undernourishment. The models generated examined the effect of background characteristics of the mother and child, on nutritional status of the child. These models were interpreted using regression parameters. β is the slope of the regression line or the coefficient corresponding to X, the predictor. It indicates the change in Y (nutritional status) per unit change in X. Exponent β is the estimated odds ratio for children who are a unit apart on X when all other predictors are held constant, usually at their mean values. Therefore, a unit difference in X is the difference between membership in a category of X and membership in the reference category. (Agresti and Finlay, 2009).

Table 2.1 Multinomial Logistic Regression Results for Height-for-age model

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Moderately stunted							
Intercept	-3.516	0.667	0.000				
Mother's Education							
Primary	-0.027	0.119	0.817	0.973	0.771	1.288	0.49
Secondary/Higher	-0.020	0.184	0.100	0.980	0.697	1.435	0.49
No Education(Ref)	0			1.000			
Age of Mother							
20-34	-0.032	0.282	0.908	0.968	0.557	1.683	0.49
35-49	-0.173	0.319	0.586	0.841	0.450	1.570	0.46
15-19 (Ref)	0						
Mother's Work Status							
Employed	0.004	0.187	0.982	1.004	0.696	1.449	0.50
Not employed (Ref)	0						
Mother's marital status							
In union	0.323	0.228	0.156	1.381	0.884	2.157	0.58
Widowed/separated/divorced	0.345	0.275	0.211	1.411	0.823	2.421	0.59
Never married (Ref)	0						
Female headed household							
Yes	0.065	0.119	0.586	1.067	0.845	1.346	0.52
No (Ref)	0						
Region of Residence							
Monrovia	0.419	0.288	0.145	1.520	0.865	2.671	0.60
North Western	0.241	0.247	0.331	1.272	0.783	2.066	0.56
South Central	0.044	0.189	0.817	1.045	0.721	1.512	0.51
South Eastern A	-0.120	0.271	0.659	0.887	0.522	1.508	0.47
South Eastern B	0.204	0.259	0.430	1.227	0.739	2.037	0.55
North Central (Ref)	0						
Type of place of residence							
Urban	-0.227	0.231	0.325	0.797	0.507	1.253	0.44
Rural (Ref)	0						
Wealth Quintile							
Poorer	0.157	0.145	0.278	1.170	0.881	1.555	0.54
Middle	0.066	0.165	0.688	1.069	0.773	1.478	0.52
Richer	0.078	0.200	0.698	1.081	0.731	1.599	0.52
Richest	-0.563	0.314	0.073	0.570	0.308	1.054	0.36
Poorest (Ref)	0						
Mother's religion							
Christian	-0.212	0.245	0.388	0.809	0.500	1.308	0.45
Muslim	-0.553	0.322	0.086	0.575	0.306	1.081	0.37
Traditional	0.635	0.571	0.266	1.888	0.616	5.736	0.65
No religion (Ref)	0						
Mother's ethnicity							
Mel	0.316	0.441	0.473	1.372	0.578	3.258	0.58
Mande	0.561	0.395	0.156	1.753	0.808	3.806	0.64
Kruan (Kwa)	0.358	0.397	0.367	1.430	0.657	3.113	0.59
Americo-Liberian (Ref)	0						
Mother's migrant status during war							
Lived in bush	0.103	0.204	0.612	1.109	0.744	1.654	0.53
Went to camp	-0.566	0.256	0.027	0.568	0.344	0.939	0.36
Stayed with relatives/friends	-0.156	0.202	0.441	0.856	0.576	1.272	0.46
Lived outside Liberia	0.117	0.207	0.571	1.125	0.749	1.688	0.53
Did not leave house (Ref)	0						

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
<i>Moderately stunted</i>							
Age of child							
6-11 months	1.328	0.337	0.000	3.773	1.949	7.305	0.79
12-23 months	2.122	0.311	0.000	8.345	4.533	15.361	0.89
24-35 months	2.109	0.313	0.000	8.242	4.464	15.217	0.89
36-47 months	2.203	0.313	0.000	9.051	4.897	16.729	0.90
48-59 months	2.208	0.320	0.000	9.101	4.860	17.044	0.90
Less than 6 months (Ref)	0						
Sex of Child							
Female	-0.307	0.102	0.003	0.736	0.602	0.900	0.42
Male (Ref)	0						
Birth Order							
2 nd	12.694	0.167	0.000	3.070	2.214	4.257	0.75
3 rd	12.679	0.171	0.000	3.115	2.227	4.356	0.76
4 th	13.113	0.179	0.000	2.019	1.422	2.866	0.67
5 th or higher	12.703	0.000	0.000	3.042	3.042	3.042	0.75
1 st (Ref)	0						
Preceding Birth Interval							
Less than 12 months	13.711	0.485	0.000	9.011	3.482	23.317	0.90
12-23 months	13.049	0.238	0.000	4.646	2.913	7.408	0.82
24-47 months	12.854	0.207	0.000	3.824	2.549	5.736	0.79
48 months or more	12.692	0.232	0.000	3.250	2.063	5.120	0.76
First birth (Ref)	0						
Access to safe source of water							
Safe source	-0.146	0.115	0.203	0.864	0.690	1.082	0.46
Unsafe source (Ref)	0						
Access to improved toilet facility							
Improved facility	-0.329	0.215	0.126	0.720	0.472	1.097	0.42
Unimproved facility (Ref)	0						
<i>Severely stunted</i>							
Intercept	-2.951	0.795	0.000				
Mother's Education							
Primary	0.114	0.122	0.348	1.121	0.883	1.423	0.53
Secondary/Higher	-0.144	0.216	0.506	0.866	0.567	1.323	0.46
No Education(Ref)	0						
Age of Mother							
20-34	-0.081	0.268	0.764	0.923	0.546	1.560	0.48
35-49	-0.058	0.309	0.852	0.944	0.515	1.729	0.49
15-19 (Ref)	0						
Mother's Work Status							
Employed	-0.443	0.180	0.014	0.642	0.451	0.914	0.39
Not employed (Ref)	0						
Mother's marital status							
In union	0.213	0.227	0.349	1.237	0.793	1.930	0.55
Widowed/separated/divorced	-0.041	0.296	0.891	0.960	0.538	1.714	0.49
Never married (Ref)	0						
Female headed household							
Yes	-0.081	0.128	0.523	0.922	0.718	1.183	0.48
No (Ref)	0						
Region of Residence							
Monrovia	-0.055	0.330	0.867	0.946	0.496	1.807	0.49
North Western	-0.840	0.279	0.003	0.432	0.250	0.746	0.30
South Central	-0.367	0.208	0.078	0.692	0.460	1.042	0.41
South Eastern A	-0.306	0.268	0.253	0.736	0.435	1.245	0.42
South Eastern B	0.007	0.265	0.978	1.007	0.599	1.695	0.50
North Central (Ref)	0						

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Moderately stunted							
Type of place of residence							
Urban	-0.211	0.253	0.404	0.810	0.493	1.330	0.45
Rural (Ref)	0						
Wealth Quintile							
Poorer	-0.019	0.145	0.898	0.982	0.739	1.303	0.50
Middle	-0.369	0.173	0.033	0.691	0.493	0.970	0.41
Richer	-0.411	0.222	0.064	0.663	0.429	1.024	0.40
Richest	-1.044	0.349	0.003	0.352	0.178	0.698	0.26
Poorest (Ref)	0						
Mother's religion							
Christian	-0.030	0.252	0.904	0.970	0.592	1.589	0.49
Muslim	0.293	0.323	0.364	1.341	0.712	1.525	0.57
Traditional	0.290	0.590	0.623	1.336	0.420	4.249	0.57
No religion (Ref)	0						
Mother's ethnicity							
Mel	-0.049	0.476	0.918	0.952	0.375	2.419	0.49
Mande	0.415	0.405	0.306	1.514	0.684	3.352	0.60
Kruan (Kwa)	0.489	0.404	0.226	1.631	0.739	3.601	0.62
Americo-Liberian (Ref)	0						
Mother's migration status during war							
Lived in bush	-0.239	0.205	0.243	0.788	0.527	1.176	0.44
Went to camp	-0.049	0.238	0.838	0.953	0.598	1.518	0.49
Stayed with relatives/friends	-0.522	0.210	0.013	0.593	0.393	0.895	0.37
Lived outside Liberia	-0.312	0.211	0.138	0.732	0.484	1.106	0.42
Did not leave house (Ref)	0						
Age of child							
6-11 months	1.846	0.577	0.001	6.335	2.043	10.627	0.86
12-23 months	3.086	0.543	0.000	21.89	7.546	36.234	0.95
24-35 months	3.209	0.544	0.000	24.76	8.534	40.986	0.96
36-47 months	3.566	0.543	0.000	35.39	12.209	58.571	0.97
48-59 months	3.724	0.545	0.000	41.43	14.243	68.617	0.98
Less than 6 months (Ref)	0						
Sex of Child							
Female	-0.419	0.108	0.000	0.658	0.532	0.813	0.39
Male (Ref)	0						
Birth Order							
2 nd	-0.019	0.793	0.991	0.981	0.029	1.933	0.50
3 rd	0.353	0.803	0.845	1.423	0.042	2.804	0.59
4 th	-0.094	0.805	0.959	0.910	0.026	1.794	0.48
5 th or higher	0.065	0.805	0.971	1.067	0.031	2.103	0.52
1 st (Ref)	0						
Preceding Birth Interval							
Less than 12 months	-0.096	0.859	0.959	0.909	0.024	1.794	0.48
12-23 months	-0.507	0.797	0.778	0.602	0.018	1.186	0.38
24-47 months	-0.896	0.793	0.617	0.408	0.012	0.804	0.29
48 months or more	-0.826	0.794	0.645	0.438	0.013	0.863	0.30
First birth (Ref)	0						
Access to safe source of water							
Safe source	-0.164	0.120	0.171	0.848	0.670	1.073	0.46
Unsafe source (Ref)	0						
Access to improved toilet facility							
Improved facility	-0.207	0.233	0.374	0.813	0.515	1.283	0.45
Unimproved facility (Ref)	0						

From Table 2.1 above, a working mother was 0.64 times as likely to have a severely stunted child as one not working. The likelihood of stunting, though small, is significant and it implies the hypothesized outcome that having a working mother puts a child at an advantage for having an adequate long-term nutritional outcome. This is supported by Senauer and Garcia (1991) who reported that the nutritional status of children of working mothers was better than that of those with non-working mothers. It is evident that children in South Eastern B and Monrovia are most likely to be severely stunted (Predicted probability, pp 0.50) and those in North Western are least likely to be (pp 0.30). These findings are contrary to the hypothesized outcome that children in the capital city, Monrovia, would have better statuses than all other regions. It is not surprising that children from the South Eastern parts suffered undernourishment because according to Mulikita (2004), these parts suffered the heaviest destruction during the war. This difference may also be explained by the agricultural geography and the socioeconomic profiles of the different regions in the country. Only the richest wealth quintile was found to be significant in differentiating between normal and severely stunted children when compared to the first wealth quintile. Children in all the other quintiles when compared to the reference category were less likely to be stunted. The relationship decreased linearly with increasing wealth. Children in the poorer quintile were more likely than those in the third to be stunted (pp=0.50 and 0.41 respectively) and children in the fourth quintile were more likely than those in the fifth to be stunted (pp=0.40 and 0.26 respectively). This finding is in agreement with Olaniyan (2002), who studied the effects of household resources and community factors on child health in Nigeria and showed that the prevalence and distribution of stunting was unequally distributed across the wealth quintiles.

Females were found to be less likely than males to suffer chronic malnutrition. Females were about 0.74 times as likely as males to be moderately stunted compared to normal (pp=0.59) and about 0.66 times as likely to be severely stunted as normal (pp=0.46). There has been evidence of a better nutritional status of female children compared to males in several studies (Moussa *et al*, 1995; El –Sayed *et al*, 2001; Marcoux, 2002). Particularly, boys tend to be at higher risk of being stunted. These findings are in conformity to findings of Wamani *et al* (2004) about Ugandan children. Nutritional insult has been attributed to differing care – giving practices based on society’s preference for a particular sex of child. Compared to children who were less than six months old, children in all the older age groups were more likely to be stunted than normal. This relationship increased linearly with increasing age. Children who are being breastfed exclusively (0-6 months) are expected to get all necessary nutrients and increased immunity from breast milk. As a result of this, children under six months of age, have the best nutritional status compared to older children. They benefit from exclusive care and attention and are less exposed to harmful environmental and pathogenic elements (WHO, 2005). Kikafunda *et al* (1998) reported that in Uganda, the absence of breastfeeding significantly increased a child’s chances of being stunted and El-Deeb *et al* (1995) found that the prevalence of stunting in Egypt was much higher for children who had been weaned early than those who had been breastfed longer.

Mothers who lived in the bush were found to be most likely to have a stunted child as compared to mothers who did not migrate during the war (pp 0.53), although only mothers who stayed at camps and those who stayed with relatives or friends were significantly

different from those who stayed at home. Mothers who stayed with relatives or friends were least likely (pp 0.37) to have severely stunted children. The assumption is that mothers who lived in the bush or at the camp may have to ration food due to the limited amount available. They would in turn have children with poorer nutrition as compared to those who lived outside the country or who may have lived with relatives and thus benefited from social capital and protection (less vulnerable).

Table 2.2 Multinomial Logistic Regression Results for Weight-for-age model

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Moderately underweight							
Intercept	-2.672	0.688	0.000				
Mother's Education							
Primary	-0.057	0.117	0.628	0.945	0.751	1.188	0.49
Secondary/Higher	-0.333	0.201	0.097	0.716	0.483	1.063	0.42
No Education(Ref)	0						
Age of Mother							
20-34	-0.303	0.251	0.227	0.739	0.452	1.207	0.42
35-49	-0.682	0.292	0.020	0.505	0.285	0.896	0.34
15-19 (Ref)	0						
Mother's Work Status							
Employed	-0.158	0.178	0.373	0.854	0.603	1.209	0.46
Not employed (Ref)	0						
Mother's marital status							
In union	0.209	0.221	0.344	1.232	0.799	1.899	0.55
Widowed/separated/divorced	0.210	0.276	0.446	1.234	0.718	2.120	0.55
Never married (Ref)	0						
Female headed household							
Yes	-0.237	0.124	0.056	0.789	0.619	1.006	0.44
No (Ref)							
Region of Residence							
Monrovia	0.184	0.291	0.528	1.202	0.679	2.126	0.55
North Western	-0.341	0.255	0.181	0.711	0.431	1.172	0.42
South Central	-0.085	0.192	0.660	0.919	0.630	1.340	0.48
South Eastern A	-0.179	0.256	0.485	0.836	0.506	1.382	0.46
South Eastern B	-0.216	0.260	0.406	0.806	0.484	1.341	0.45
North Central (Ref)	0						
Type of place of residence							
Urban	0.070	0.228	0.758	1.073	0.686	1.677	0.52
Rural (Ref)	0						
Wealth Quintile							
Poorer	0.040	0.142	0.777	1.041	0.788	1.376	0.51
Middle	0.099	0.163	0.544	1.104	0.802	1.518	0.52
Richer	-0.209	0.209	0.318	0.811	0.538	1.223	0.45
Richest	-0.798	0.328	0.015	0.450	0.237	0.857	0.31
Poorest (Ref)	0						
Mother's religion							
Christian	0.035	0.243	0.887	1.035	0.643	1.666	0.51
Muslim	-0.081	0.315	0.796	0.922	0.498	1.708	0.48
Traditional	-0.014	0.576	0.981	0.986	0.319	3.050	0.50
No religion (Ref)	0						

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Mother's ethnicity							
Mel	-0.391	0.388	0.313	0.676	0.316	1.446	0.40
Mande	-0.386	0.330	0.243	0.680	0.356	1.299	0.40
Kruan (Kwa)	-0.249	0.329	0.450	0.780	0.409	1.486	0.44
Americo-Liberian (Ref)	0						
Mother's migration status during war							
Lived in bush	-0.193	0.196	0.325	0.824	0.561	1.211	0.45
Went to camp	0.067	0.227	0.766	1.070	0.686	1.668	0.52
Stayed with relatives/friends	-0.396	0.197	0.045	0.673	0.457	0.991	0.40
Lived outside Liberia	-0.126	0.199	0.527	0.882	0.597	1.303	0.47
Did not leave house (Ref)	0						
Age of child							
6-11 months	2.383	0.458	0.000	10.839	4.419	26.584	0.92
12-23 months	2.739	0.444	0.000	15.479	6.480	36.975	0.94
24-35 months	2.643	0.444	0.000	14.059	5.885	33.585	0.93
36-47 months	2.340	0.446	0.000	10.378	4.326	24.898	0.91
48-59 months	2.446	0.448	0.000	11.542	4.793	27.794	0.92
Less than 6 months (Ref)	0						
Sex of Child							
Female	-0.227	0.101	0.024	0.797	0.654	0.971	0.44
Male (Ref)	0						
Access to safe source of drinking water							
Safe source	-0.213	0.114	0.063	0.808	0.646	1.012	0.45
Unsafe source (Ref)	0						
Access to improved toilet facility							
Improved facility	-0.092	0.219	0.676	0.913	0.594	1.401	0.48
Unimproved facility (Ref)	0						
Severely underweight							
Intercept	-8.085	3.329	0.015				
Mother's Education							
Primary	0.058	0.189	0.757	1.060	0.732	1.536	0.51
Secondary/Higher	-0.151	0.327	0.644	0.860	0.453	1.631	0.46
No Education(Ref)	0						
Age of Mother							
20-34	0.060	0.360	0.867	1.062	0.525	2.149	0.52
35-49	0.074	0.444	0.868	1.077	0.451	2.570	0.52
15-19 (Ref)	0						
Mother's Work Status							
Employed	-0.196	0.291	0.500	0.822	0.464	1.454	0.45
Not employed (Ref)	0						
Mother's marital status							
In union	0.425	0.318	0.181	1.530	0.820	2.853	0.60
Widowed/separated/divorced	-0.430	0.488	0.378	0.650	0.250	1.693	0.39
Never married (Ref)	0						
Female headed household							
Yes	0.285	0.187	0.129	1.329	0.921	1.919	0.57
No (Ref)	0						
Region of Residence							
Monrovia	0.433	0.489	0.376	1.542	0.591	4.021	0.61
North Western	-1.150	0.512	0.025	0.316	0.116	0.863	0.24
South Central	0.136	0.309	0.659	1.146	0.626	2.100	0.53
South Eastern A	0.241	0.404	0.551	1.272	0.576	2.811	0.56
South Eastern B	0.145	0.411	0.723	1.157	0.517	2.586	0.54
North Central (Ref)	0						

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Type of place of residence							
Urban	0.288	0.383	0.452	1.334	0.630	2.824	0.57
Rural (Ref)	0						
Wealth Quintile							
Poorer	-0.078	0.224	0.726	0.925	0.596	1.433	0.48
Middle	-0.310	0.271	0.253	0.733	0.431	1.248	0.42
Richer	-0.930	0.377	0.014	0.394	0.188	0.826	0.28
Richest	-1.783	0.577	0.002	0.168	0.054	0.521	0.14
Poorest (Ref)	0						
Mother's religion							
Christian	0.262	0.422	0.535	1.299	0.568	2.970	0.57
Muslim	0.785	0.527	0.136	2.192	0.781	6.151	0.69
Traditional	-1.598	0.543	0.969	0.202	0.074	0.621	0.17
No religion (Ref)	0						
Mother's ethnicity							
Mel	0.883	0.872	0.311	2.419	0.438	13.365	0.71
Mande	0.966	0.780	0.215	2.628	0.570	12.115	0.72
Kruan (Kwa)	0.980	0.776	0.207	2.665	0.582	12.205	0.73
Americo-Liberian (Ref)	0						
Mother's migration status during war							
Lived in bush	-0.121	0.306	0.693	0.886	0.487	1.614	0.47
Went to camp	-0.376	0.396	0.342	0.687	0.316	1.490	0.41
Stayed with relatives/friends	-0.317	0.310	0.307	0.729	0.397	1.338	0.42
Lived outside Liberia	-0.480	0.326	0.141	0.619	0.326	1.173	0.38
Did not leave house (Ref)	0						
Sex of Child							
Female	0.145	0.169	0.393	1.156	0.829	1.611	0.54
Male (Ref)	0						
Access to safe source of water							
Safe source	-0.341	0.189	0.072	0.711	0.491	1.031	0.42
Unsafe source (Ref)	0						
Access to improved toilet facility							
Improved facility	0.260	0.337	0.441	1.296	0.669	2.511	0.56
Unimproved facility (Ref)	0						

From Table 2.2, a mother who is the head of the household was 0.78 times as likely to have a moderately underweight child as one who does not head the household. The likelihood of underweight is significant and it implies the hypothesized outcome that having a mother who is a household head puts a child at an advantage for having an adequate weight for his or her age. This is supported by Khasnobis and Hazarika (2006) who demonstrated that improved women's relative household status leads to better nutritional status of children which seems important particularly in developing countries where women have lower social and economic statuses. Children in South Eastern A and Monrovia are most likely to be severely stunted (Predicted probability, pp 0.56 and 0.61) and those in North Western are least likely to be (pp 0.24). These findings are contrary to the hypothesized outcome that children in the capital city, Monrovia, would have better statuses than all other regions. As mentioned earlier, it is not surprising that children from the South Eastern parts suffered undernourishment because according to Mulikita (2004), these parts suffered the heaviest destruction during the war.

This difference may also be explained by the agricultural geography and the socioeconomic profiles of the different regions in the country.

Both the richest and richer wealth quintiles were found to be significant in differentiating between normal and severely underweight children when compared to the first wealth quintile. Children in all the other quintiles when compared to the reference category were less likely to be underweight. The relationship decreased linearly with increasing wealth. Children in the poorer quintile were more likely than those in the third to be stunted (pp=0.48 and 0.42 respectively) and children in the fourth quintile were more likely than those in the fifth to be severely underweight (pp=0.28 and 0.14 respectively). This finding is in agreement with Olaniyan (2002), who studied the effects of household resources and community factors on child health in Nigeria and showed that the prevalence and distribution of underweight, like stunting, was unequally distributed across the wealth quintiles.

Females were found to be less likely than males to suffer low weight-for-age. Females were about 0.79 times as likely as males to be moderately underweight compared to normal. These findings are in conformity to findings of Wamani *et al* (2004) about Ugandan children. This may be as a result of differing care –giving practices based on society’s preference for a particular sex of child. Compared to children who were less than six months old, children in all the older age groups were more likely to be underweight than normal. This relationship was however not linear. Children under two years were most likely to be underweight (pp 0.94) whereas. The children’s statuses improved thereafter but declined slightly after age four. This later decline may be as a result of being weaned from breast milk hence less attention from mothers and more exposure to harmful elements (WHO, 2005).

Mothers who lived at camps were found to be most likely to have an underweight child as compared to mothers who did not migrate during the war (pp 0.52), although only mothers who stayed with relatives or friends were significantly different from non-migrants. Mothers who stayed with relatives or friends were least likely (pp 0.40) to have moderately underweight children.

Table 2.3 Multinomial Logistic Regression Results for Weight-for-Height model

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Moderately wasted							
Intercept	-4.226	1.090	0.000				
Mother’s Education							
Primary	0.123	0.204	0.546	1.131	0.758	1.688	0.53
Secondary/Higher	0.066	0.321	0.836	1.069	0.569	2.005	0.52
No Education(Ref)	0						
Age of Mother							
20-34	0.314	0.479	0.513	1.368	0.535	3.498	0.58
35-49	-0.179	0.547	0.743	0.836	0.286	2.444	0.46
15-19 (Ref)	0						
Mother’s Work Status							
Employed	0.097	0.338	0.773	1.102	0.568	2.138	0.52
Not employed (Ref)	0						
Mother’s marital status							
In union	-0.413	0.335	0.218	0.662	0.343	1.277	0.40

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Widowed/separated/divorced	-1.051	0.507	0.038	0.350	0.129	0.944	0.26
Never married (Ref)	0						
Female headed household							
Yes	0.115	0.209	0.581	1.122	0.745	1.689	0.53
No (Ref)	0						
Region of Residence							
Monrovia	0.356	0.472	0.451	1.427	0.566	3.600	0.59
North Western	0.424	0.453	0.349	1.528	0.629	3.710	0.60
South Central	0.606	0.324	0.061	1.834	0.972	3.460	0.65
South Eastern A	-0.107	0.442	0.809	0.898	0.378	2.138	0.47
South Eastern B	0.405	0.418	0.332	1.500	0.661	3.404	0.60
North Central (Ref)	0						
Type of place of residence							
Urban	0.274	0.356	0.441	1.315	0.655	2.640	0.57
Rural (Ref)	0						
Wealth Quintile							
Poorer	-0.238	0.255	0.350	0.788	0.479	1.298	0.44
Middle	-0.068	0.281	0.809	0.935	0.539	1.621	0.48
Richer	-0.919	0.391	0.019	0.399	0.185	0.859	0.29
Richest	-0.731	0.543	0.179	0.481	0.166	1.397	0.32
Poorest (Ref)	0						
Mother's religion							
Christian	-0.221	0.429	0.607	0.802	0.346	1.859	0.45
Muslim	-0.508	0.581	0.382	0.602	0.193	1.879	0.38
Traditional	-1.828	0.374	0.441	0.161	0.002	16.878	0.14
No religion (Ref)							
Mother's ethnicity							
Mel	-0.012	0.757	0.987	0.988	0.224	4.357	0.50
Mande	0.077	0.665	0.908	1.080	0.293	3.980	0.52
Kruan (Kwa)	0.405	0.658	0.538	1.499	0.413	5.443	0.60
Americo-Liberian (Ref)	0						
Mother's migration status during war							
Lived in bush	-0.237	0.357	0.506	0.789	0.392	1.588	0.44
Went to camp	-0.169	0.427	0.693	0.845	0.366	1.952	0.46
Stayed with relatives/friends	0.299	0.329	0.362	1.349	0.708	2.570	0.57
Lived outside Liberia	0.079	0.354	0.824	1.082	0.540	2.165	0.52
Did not leave house (Ref)	0						
Age of child							
6-11 months	1.642	0.444	0.000	5.166	2.162	12.346	0.84
12-23 months	1.508	0.432	0.000	4.516	1.938	10.526	0.82
24-35 months	0.515	0.462	0.264	1.674	0.677	4.139	0.63
36-47 months	0.243	0.478	0.612	1.275	0.499	3.254	0.56
48-59 months	-0.207	0.528	0.695	0.813	0.289	2.289	0.45
Less than 6 months (Ref)	0						
Sex of Child							
Female	0.213	0.182	0.241	1.237	0.867	1.766	0.55
Male (Ref)	0						
Access to safe source of drinking water							
Safe source	0.179	0.207	0.385	1.196	0.798	1.794	0.54
Unsafe source (Ref)	0						
Access to improved toilet facility							
Improved facility	-0.635	0.408	0.119	0.530	0.238	1.178	0.35
Unimproved facility (Ref)	0						

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Severely wasted							
Intercept	-7.747	2.063	0.000				
Mother's Education							
Primary	-0.195	0.330	0.554	0.823	0.431	1.571	0.45
Secondary/Higher	0.408	0.424	0.335	1.504	0.656	3.450	0.60
No Education(Ref)	0						
Age of Mother							
20-34	0.216	0.728	0.767	1.241	0.298	5.169	0.55
35-49	0.690	0.826	0.403	1.994	0.395	10.064	0.67
15-19 (Ref)	0						
Mother's Work Status							
Employed	1.336	0.880	0.129	3.802	0.678	21.319	0.79
Not employed (Ref)	0						
Mother's marital status							
In union	-0.195	0.507	0.700	0.823	0.305	2.223	0.45
Widowed/separated/divorced	-1.206	0.831	0.146	0.299	0.059	1.524	0.23
Never married (Ref)	0						
Female headed household							
Yes	0.331	0.304	0.276	1.393	0.767	2.528	0.58
No (Ref)	0						
Region of Residence							
Monrovia	1.051	0.778	0.177	2.861	0.623	13.146	0.74
North Western	-0.934	0.021	0.361	0.393	0.053	2.911	0.28
South Central	0.317	0.506	0.531	1.373	0.509	3.703	0.58
South Eastern A	-0.415	0.794	0.601	0.660	0.139	3.133	0.40
South Eastern B	0.627	0.613	0.306	1.872	0.564	6.220	0.65
North Central (Ref)	0						
Type of place of residence							
Urban	0.010	0.669	0.100	1.000	0.270	3.706	0.50
Rural (Ref)	0						
Wealth Quintile							
Poorer	0.183	0.409	0.655	1.201	0.538	2.678	0.55
Middle	0.562	0.434	0.195	1.755	0.750	4.107	0.64
Richer	-0.423	0.588	0.472	0.655	0.207	2.075	0.40
Richest	-1.209	0.822	0.141	0.299	0.060	1.495	0.23
Poorest (Ref)	0						
Mother's religion							
Christian	-0.249	0.618	0.686	0.779	0.232	2.614	0.44
Muslim	-0.686	0.902	0.447	0.504	0.086	2.952	0.34
Traditional	-1.453	0.705	0.695	0.234	0.024	3.409	0.19
No religion (Ref)	0						
Mother's ethnicity							
Mel	1.148	0.410	0.415	3.153	0.199	5.035	0.76
Mande	0.774	0.321	0.558	2.169	0.163	2.860	0.68
Kruan (Kwa)	0.822	0.318	0.533	2.275	0.172	3.121	0.69
Americo-Liberian (Ref)	0						
Mother's migration status during war							
Lived in bush	-0.138	0.526	0.793	0.871	0.310	2.444	0.47
Went to camp	-0.750	0.817	0.359	0.472	0.095	2.343	0.32
Stayed with relatives/friends	0.027	0.508	0.958	1.027	0.379	2.783	0.51
Lived outside Liberia	0.427	0.518	0.409	1.533	0.556	4.229	0.61

	B	Std. Error	Sig.	Exp (B)	95% C I for Exp(B)		Predicted Probability
Did not leave house (Ref)	0						
Age of child							
6-11 months	1.690	0.863	0.050	5.419	0.999	29.397	0.84
12-23 months	2.058	0.817	0.012	7.830	1.579	38.826	0.89
24-35 months	1.227	0.842	0.145	3.410	0.654	17.780	0.77
36-47 months	0.003	0.947	0.998	1.003	0.157	6.417	0.50
48-59 months	0.705	0.892	0.429	2.024	0.352	11.628	0.67
Less than 6 months (Ref)	0						
Sex of Child							
Female	-0.223	0.276	0.418	0.800	0.466	1.373	0.44
Male (Ref)	0						
Access to safe source of water							
Safe source	-0.104	0.307	0.735	0.902	0.494	1.645	0.47
Unsafe source (Ref)	0						
Access to improved toilet facility							
Improved facility	0.359	0.489	0.462	1.432	0.550	3.731	0.59
Unimproved facility (Ref)	0						

Compared to children who were less than six months old, children in all the older age groups were more likely to be moderately wasted than normal. This relationship decreased linearly with increasing age meaning that as a child grows the less likely he or she is to suffer low weight for height. However, the likelihood of having severe low weight-for-height showed a peak in the second year of life compared to all other ages. This relationship may stem from the fact that infants and younger children may be more susceptible to illness thus suffer wasting or thinness, which indicates in most cases a recent and severe process of weight loss, often associated with acute starvation and/ or severe disease (WHO, 1995). The findings are supported by de Onis and Blössner (1997) who documented that typically, the prevalence of low weight-for-height shows a peak in the second year of life. Wasting has been known to be closely linked to malaria, diarrhoea and other sicknesses where children are unable to eat well. However, wasting may also be the result of a chronic unfavourable condition such as the civil war in Liberia.

Summary

Malnutrition remains one of Africa's most fundamental challenges for human welfare and economic growth. Far too many people on the continent, especially children under five years of age, are unable to acquire and effectively utilize at all times the food they need for a healthy life. Because of low food availability and profound poverty, an estimated 200 million people on the continent are undernourished, and their numbers have increased by almost 20 percent since the early 1990s. The result is that more than a third of African children are stunted in their growth and must face a range of physical and cognitive challenges not faced by their better-fed peers. Undernutrition is the major risk factor underlying over 28 percent of all deaths in Africa (some 2.9 million deaths annually). The continuing human costs of inadequate food and nutrition are enormous, and the national level imposes a heavy burden

on efforts to foster sustained human development. The analysis of the DHS data has shown that malnutrition is a problem among Liberian children. It is indicated that almost one out of three of the children covered by the survey was stunted and one out of five children is underweight. This is significantly high even by Sub Saharan Africa standard. Moreover, if the country wants to achieve the target set by the Millennium Development goal, then the prevalence of undernutrition is has to be lowered. The prevalence rate of child malnutrition shows significant differences amongst maternal educational attainment levels as well as other socioeconomic and demographic characteristics of mothers and children. In addition, the household health environment shows a significant difference between rural and urban households. It is found out that urban households have generally better access to safe water and better sanitation compared to rural households.

Outstanding differentials in educational attainment between rural and urban areas existed. More than three quarters of the rural mothers had never been to school. The highest proportion of mothers, hence their children, belonged to the poorest (27.6%) and poorer (27.2%) wealth quintiles. It has been shown that more than 90 percent of rural households had no access to improved toilet facility which is only a third more than that of urban areas (70.9%). About a half of rural mothers had access to safe drinking water compared to 81% in urban areas. A Chi Square test to examine the strength of the bivariate association between the background characteristics of the respondents and their nutritional status indicators shows that mothers' highest level of educational attainment is significantly associated with stunting and underweight alongside marital status of mothers, ethnicity, migrant status during the war, type of place of residence, region of residence, wealth of household, access to safe source of drinking water, access to improved toilet facility, the child's age, sex, birth order and birth interval. The association between employment status of mothers' and nutritional status is found to be weaker. The multivariate analysis showed that the strong association between mothers' education and nutritional status of children diminished after controlling for other background characteristics. Migration status of mothers during war, region of residence, wealth of household, age and sex of child was found to be important determinants of child nutritional status in Liberia. Their effects on height-for-age and weight-for-age is strong even compared to the other household characteristics. In contrast, employment status of women was a weak predictor of nutritional status of children such that it emerged as a significant contributor to only height-for-age z-score of a child. Female headed household status of women was also a weak predictor of nutritional status of children such that it emerged as a significant contributor to only weight-for-age z-score of a child. However only age of the child was found to be an important determinant of short term malnutrition or wasting. The multivariate analysis also demonstrates that age of a child and wealth index of households have a statistically significant effect on nutritional status. Household health environment as measured by access to water and sanitation, was associated with nutritional status but not in all cases.

Conclusions

The following conclusions were drawn from the study based on analysed data: Liberian children suffer from chronic and acute under nourishment. Thirty-six percent are chronically

undernourished, twenty-three percent are underweight whilst six percent of them are acutely undernourished. The most significant determinants of children's nutritional status in general are region of residence, age of child, sex of the child, wealth of household and migration status during the war.

Recommendation

The objective of this paper was to examine the importance of maternal characteristics on nutritional status of Liberian children. The findings of the empirical analysis show that mothers' household status is indeed a significant contributor to nutritional status of children. Consequently, intervention programs focusing on mothers' or in general women's status would contribute to the effort towards alleviating the problem of child malnutrition in Liberia. In particular, taking into account the low level of mothers' education at national level and especially in rural parts of the country, policy actions that are meant to improve the educational status of women are critical in addressing the problem through improving their income earning capacity and also enhancing the quality of care and attention they can provide to their children. In addition, interventions for improving household status of women are important. This seems crucial since women in Liberia have a lower economic and social status which may have been exacerbated by the civil war. Therefore, effort should be directed towards changing the attitude of society with respect to practices which undermine the status of women. Also, bridging the educational attainment gap between educated and uneducated women and encouraging women's participation in income generating activities can improve women's status and thereby their children's nutritional status. Further work is proposed on how changes in the health policies in Liberia over the period spanning the civil war have had several implications on the health priorities in Liberia and implicitly affected the health status of Liberian children.

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