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The Effect of Household Characteristics on Child Mortality in Uganda

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Abstract The objective of this study was to establish the relationship between household characteristics and mortality among children under the ages of five in Uganda. Uganda in 2006experienced a high infant mortality rate of 76 deaths per 1000, far above the world's average of 52 deaths /1000 live births. Of the infants that survive to the first birthday, 67 out of 1000 died before reaching their fifth birthday. In order to address this problem, the authors used survey data on 4,169 women respondents drawn from 14 districts of Uganda where the Uganda Ministry of Health intended to implement the Health Sector Strategic Plan II (2005/06 – 2009/10). Brass-type indirect techniques for mortality estimation were employed to establish the mortality rates. In addition, logistic regression analysis examined factors related with child mortality. Findings show wide mortality differentials by household type, place of residence, and household size. Mother's education and children ever born were the two major variables highly associated with child mortality. The study concludes that household structure was not related to child mortality. There is need for adult literacy, secondary and above education for women and sensitization about the effects of large households and children ever born. Such studies provide insight into understanding the relationship between various household characteristics and child health outcomes.

Keywords Household, Characteristics, Child, Mortality, Uganda

1. Introduction

More than 10 million children are said to be dying each year in the developing countries the vast majority from causes of easily preventable diseases. In low income countries, one child in 11 children dies before reaching its 5th birthday compared to 1 in 143 born in high income countries[1]. According to under-five mortality estimates in the world, Uganda was ranked 27th among the leading countries with a rate of 90 deaths per 1000 live births[2]. The rates are similar to the current Uganda demographic and health survey estimates of 2011 which indicated that over 90 children out of 1000 live births die before their fifth birthday, while 50 infants out of 1000 die before their first birthday[3]. Given the prevailing country's mortality rates, the 2015 Millinium Development Goals is unattainable[3-6]. Reduction of these rates to the least figures is pertinent to the well-being of these children. Although the rates are still high, most of the leading causes of deaths among the under-fives in the country are easily preventable and related to public health seeking behaviours. The vast majority of deaths are due to malaria, perinatal and early neonatal conditions, meningitis, pneumonia and HIV/AIDS[1, 2, 7].

Children are the most vulnerable groups of people that are subject to the risk of deaths as a result of diseases related to socio-economic and cultural factors of the households[3, 8, 9]. Research has shown that a household is a micro unit of production, reproduction, specialization, association, consumption for the society as well as a fundamental and socio-economic unit in country[10, 11]. In Uganda the average size per household is five people and it varies across all the regions[12]. In most cases the size and composition of households depends on the demographic, social, cultural and economic conditions in a respective area[13]. Traditionally, large households with many siblings were considered to be prestigious and as a source of sustenance in old age. However, this exposes children to the risk of death given the economic constraints of large households[10, 14]. This is because the capacity of a household to adequately meet the needs of all the members is affected by household structure comprising household size, household type, number of children ever born and place of residence among others[15, 16]. Bronte-Tinkew and Hewett[17] examined the link between household structure, household economic status, child well being and found that household structure, not necessarily household economic status, would affect the wellbeing of a child. Though the question of household structure remains a problem, there are no adequate explanations for the relationships between child survival and

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household characteristics. This paper examined the relationship between child mortality and household characteristics in 14 districts of Uganda.

2. Methodology

This paper uses a data set based on Support to Health Sector Strategic Plan (SHSSP) survey of July 2004. The survey was carried out on a sample of 7600 households in 14 districts of Uganda with a 95% response rate. The districts where SHSSP study was conducted were Arua, Adjumani, Apac, Kaberamaido, Moyo, Soroti, Kapchorwa, Katakwi, Nebbi, Mubende, Bushenyi, Bugiri, Lira and Yumbe. The districts were chosen by the Ministry of Health (Uganda) for being disadvantaged in terms of health issues, infrastructure and socioeconomic development. The survey used both qualitative and quantitative methods of data collection aimed at providing basic data for the development of the national communication strategy for the provision of the National Minimum Health Care Package.

Data used for analysis in this paper was based on information on all births and deaths that had occurred five years prior to the survey data. Statistical package for social scientists (SPSS) and STATA ver. 9.0 were used for extraction and the eventual analysis of data. Descriptive statistics and frequencies of the background characteristics of the mothers and the respective households the children belong to were generated. The association between the independent and dependent variable was established using chi-square analysis procedures. The dependent variable selected was the outcome of a question asked whether a child born alive in a household had died or survived. The independent variables included children ever born, household size, residence, type of toilet facility, source of drinking water and mothers' characteristics including; education, religion and age. A critical level of significance of 5 percent ($p \leq 0.05$) was used to identify the most statistically significant determinants of child mortality at the household level.

Estimates of infant and child mortality were obtained for the overall study districts. Indirect techniques of childhood mortality estimation based on the Brass type of indirect procedures[18] were employed to estimate the probabilities of dying for children in the program districts. Mortality estimates and differentials studied herein are for the study areas not by districts. The procedure employed is expressed as follows:

$$ {}_nq_x = k_i * D_i \quad (1) $$

Where

${}_n q_x$ is the probability of dying between age x to x+n

k_i is the multiplier for conversion of proportion dead to probability of dying at the age x and

D_i is the observed proportion of children dead in the population[14].

Furthermore, the north family model life tables were used because they were found to be suitable for Uganda. The Brass procedure used herein allows for the estimation of the reference period which mortality estimates SHSSPS data set had. This was important because it affords us the opportunity to examine the trends in the infant and child mortality.

The binary logistic regression model was used to study whether the independent factors affected a child chance of surviving or not. The parameters of the model were estimated using the maximum likelihood method as shown below in the formula;

$$ P(\pi) = \frac{\ell^Z}{1+\ell^Z} \quad (2) $$

Where $P(\pi)$ = the probability of an even occurring

Z = is the linear combination of independent variables and is expressed as

$$ Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_i X_j \quad (3) $$

β_1 = are the coefficients

X_s = are the independent variables

95% confidence interval

ℓ = is the error term

The odd of an event is the probability that it would happen to the probability that it would not occur and the likely number of times. In this paper it is the probability that a mother will lose a child to the probability that the person would not lose one. This means that the outcome variables in the logistic regression should be discrete and dichotomous. Logistic regression was found fit to be used because the outcome variable was in binary form that is a child born alive survived or otherwise died. In addition, there were no assumptions to be made about the distributions of the explanatory variables as they did not have to be linear or equal in variance within the group. The model suggests that the likelihood of a person to losing a child varies across all the independent variables to be studied. After fitting the model, the outcomes were used to interpret the existing relationships between ones' child survival, household structure and mothers characteristics.

3. Results

The results of the analysis are presented in Table 1. The table shows most of the respondents were from rural areas irrespective of whether the household was nuclear (94%) or extended in nature (94%). The majority of the respondents belonged to age group 25 to 34 years, with extended households having slightly higher percentages (47%) than nuclear households which reported only 40 percent. More than half of the respondents who participated in the survey had been to a formal school. The highest percentage for educational level attained was primary with (59%) and (64%) for nuclear and extended, respectively. Majority of the respondents were Catholics with 52 and 50 percent for nuclear and extended households, respectively. Nearly all

households had access to safe drinking water and toilet facility. Nuclear households had 1-3 children born (43%) more than extended households (29%).

Table 1. Percent Distributions of selected background characteristics of the respondents by household type

Household characteristics	Household type		Total (N)
	Nuclear (%)	Extended (%)	
Residence			
Urban	6.3	7.5	307
Rural	93.7	92.5	4556
Age			
19-24	28.5	19.7	1339
25-34	40.3	47.4	1938
35+	31.2	32.9	1494
Educational level			
Never attended	31.8	28.6	1539
Primary	58.6	64.1	2861
Secondary +	9.6	7.3	463
Religion			
Catholic	51.7	49.5	2509
Protestant	30.4	33.6	1484
Muslim	8.2	9.1	400
Other	9.8	7.7	470
Household size			
1-3 (Small)	30.4	34.6	1403
4-6 (Medium)	43.7	41.7	2003
7+ (Large)	25.9	23.7	1186
Children Ever Born			
1-3	42.8	29.0	1928
4-6	36.8	48.1	1706
7+	20.3	22.9	935
Source of drinking water			
Piped water	55.8	55.5	2711
Protected well	41.5	42.7	2022
Other	2.7	1.8	130
Type of toilet			
Pit latrine	95.3	95.5	4637
No facility	4.7	4.5	226

Mortality differentials by household characteristics are presented in Table 2. The highest mortality rates were recorded in extended households ranging from as high as 114 deaths per 1000 live births for under-fives to 72 deaths per 1000 live births for infant mortality. With regard to household type the mortality distributions by household characteristics present wide mortality differentials by residence.

Unexpectedly, the table shows that urban areas had higher child and infant mortality rates than the rural areas. The urban centres had 107/ 1000 for under-five mortality rate compared to 84 deaths for rural areas and 69 deaths for infants against 55 deaths per 1000 live births respectively. This is contrary to what has been found in most studies[19, 20].

For instance nationally, Infant and Child mortality rates were found to be higher in the rural and the urban areas in the 2002 Housing and population census and previous Demographic and Health Surveys[3, 21, 22]. Not surprisingly, large households had higher infant and child mortality rates than medium and small households. This is because large households are more likely to share facilities

Table 2. Childhood mortality indicators by selected characteristics (per 1000 live births)

Household characteristics	Infant mortality	Child mortality	Under-five mortality
Household type			
Nuclear	57.0	31.3	86.3
Extended	72.0	44.7	113.7
Residence			
Rural	55.0	30.0	84
Urban	68.7	42.0	107
Household size			
Small	56.0	30.7	85.0
Medium	63.7	37.3	98.3
Large	65.7	39.0	102.0

Table 3 gives cross tabulations of child survival and the household conditions. The table shows that the children from extended households died (41%) than those in nuclear households (32%). The association between household type and survival was significant (p=0.014).

This is an expected result since people in nucleated households can have access to the meager necessities compared to those in extended households. Previous studies have shown that household size is very important in child survival status, in that as household size increases, so does the risk of the child dying under the age of five[23, 24].

Table 3. Characteristic of household by survival status of child

Household Characteristic	Child died Yes (%)	Total N=4160
Household type		
Nuclear	32.3	3973
Extended	40.8	196
Chi-square= 6.089 , p= 0.014		
Household Size		
Small (1-3)	32.6	1191
Medium (4-6)	33.9	1730
Large (7+)	31.7	1014
Chi-square=1.507, p=0.471		
Source of drinking water		
Piped water	32.6	2340
Protected Well	35.0	1720
Others	31.2	109
Chi-square= 4.560, p=0.102		
Toilet facility		
Toilet facility	32.6	3986
No toilet facility	35.0	183
Chi-square=0.433, p=0.511		

However, the results in Table 3 does not show persistent pattern and does not indicate statistical association between household size and child mortality (p=0.471). Unsanitary

environment conditions of the household increases the chances of dying for the children related water borne diseases. Previous studies have indicated that children born to mothers in households with safe source of drinking water were more likely to survive[25]. However, the results in Table 3 show the contrary. Children living in households using protected wells died most (35%), while households with unsafe sources of water died least (31%) even better than children in households with piped water (33%). It is probable that the so called protected wells and piped water were not safe.

Table 4. Logistic Regression of factors affecting child mortality at the household level than smaller ones

Household Characteristics	Odds Ratio	Z	**p**-value
Household type			
Nuclear ***	1.000	-1.67	
Extended	0.475		0.095
Household size			
1-3 ***	1.000		
4-6	1.280	1.79	0.074
7+	1.015	0.09	0.927
Source of drinking Water			
Tap Water***	1.000		
Protected Well	1.319	2.28	0.023
Other	1.168	0.42	0.675
Type of Toilet			
Flush/VIP ***	1.000		
Pit Latrine	0.923	-0.20	0.845
No facility	0.972	-0.06	0.955
Other	0.271	-1.08	0.282
Children born			
1-3 ***	1.000		
4-6	2.827	7.58	0.000
7+	10.189	14.41	0.000

Note: *** =Reference Category

Findings from regression analysis of household characteristics and child mortality are presented in Table 4. Results show that belonging to an extended type of household increased the risk of dying for children in these households relative to those in nuclear households. The findings herein are however marginally significant (p=0.095), therefore the results here may not be conclusive. Additionally, the findings though not significant suggest that the larger the household size the higher the risk of dying for the children. Among the household living conditions studied, source of drinking water was found to be associated with child mortality.

The findings in Table 4 suggest that households with no piped water as a source of drinking water had their children exposed to the risk of death. This probably is due to the fact that water from the well is not treated to kill pathogens of water borne diseases. Despite the fact that the differences in household structure mortality estimates were registered, the model out in Table 43 indicates no significant relationship between type of toilet facility, place or residence and household type.

4. Discussion

It is not surprising that mothers' characteristics were found to be significantly associated with whether a child that was born alive had survived or later died. Characteristics of the mother found to be associated with child survival at Bivariate analysis level were; household type, religion, education, children ever born and age of the mother. The association between the socioeconomic factors on child mortality has been explained in the Mosley-Chen framework[3, 8, 25].

This further explains the direct impact of some back ground characteristics of mother have on her child's survival status. Indeed household type plays a significant role in child survival status, in that children born in extended households were more likely to die than their counter parts. This is so true given the socio-economic constraints of large households[10]. This was also confirmed with the mortality estimates generated using Brass techniques which presented children born in extended households having a high risk of death. There were mortality differentials recorded for household size, as children a nuclear household were more likely to survive.

Unexpected though were the household characteristics like place of residence, type of toilet facility and source of drinking water were found not to have any statistical association with whether the child born alive died or otherwise. These findings contradict with the other findings of[15, 26] who examined the contribution of household environment to urban childhood mortality. These found that children whose mothers lived in households with no toilet facility as well as source of drinking water had a high risk dying compared to their counterparts.

5. Conclusions

Attaining the anticipated 2015 Millennium Development Goal 4 is impossible with the prevailing high under five mortality estimates. This paper delved into exploring the effect of household characteristics on child survival status. Findings show wide mortality differentials by household type, place of residence, and household size. Mother's education and children ever born were the two major variables highly associated with child mortality.

Basing on the findings, it is imperative that the government together with other development partners, including policy makers, programme managers to design programs that will directly sensitize people on the danger of having so many children born in the households. There is need for the government to encourage mothers' secondary and above education. Massive public awareness should be made to educate people on the dangers of bearing children beyond the age of 40 years and its consequences on children.

People should also be sensitized and encouraged to have few people in the households. The government should further elevate mothers economically so that they can provide the basic requirements for the children.

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