The effect of household characteristics on child mortality

By

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Abstract

Uganda has a high Infant Mortality Rate of 76 deaths per 1000, far above the world's average of 52 deaths /1000 live births. Of those who survive to the first birthday 67 out of 1000 die before reaching their fifth birthday. The paper established the relationship between household structure and child mortality. Using survey data on 4,169 respondents in 14 districts of Uganda, Brass' indirect techniques for mortality estimation were employed to establish the mortality rates. In addition, logistic regression procedures 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 highly associated with 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.

Background

According to under-five mortality estimates in the world, Uganda was ranked 28th among the leading countries with a rate of 136 deaths per 1000 live births (UNICEF 2007). The rates are similar to the current Uganda demographic and health survey estimates of 2006 which indicated that over 137 children out of 1000 live births die before their fifth birthday, while 76 infants out of 1000 die before their first birthday (UBOS and Macro international , 2007, PRB, 2007 and PRB, 2006). Although the rates are 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.

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 (UNICEF 2001). Children are the most vulnerable groups of people that are subject to the risk deaths as a result of diseases related to socio-economic and cultural factors of the households. 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 the country (Nakiyingi 1997, Bongaarts 2001). In Uganda the average size per household is five people and it varies across all the regions (Republic of Uganda 1991). In most cases the size and composition of households depends on the demographic, social, cultural and economic conditions in a respective area (Musin and Stratigos, 1991). 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 (Bongaarts 2001, Kalipeni 1995). 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 (Lloyd, 1995, Davanzo 1984). Bronte-Tinkew and Hewett (2004) examined the link between household structure, household economic status, child well being and found that household structure would affect the wellbeing of a child and not neccesarily the household economic status. Though the question of household structure still remains a problem, there are no adequate explanations for the relationships between child survival and household characteristics. The purpose of this paper is to establish the relationship between child mortality and household characteristics.

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.

Measurement of Infant and child Mortality

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 (UN Manual X 1983) were employed to estimate the probabilities of dying for children in the program districts. The mortality estimates and differentials studied herein are for the study area not by districts. The procedure employed is expressed as follows:

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

Where

${}_nq_x$ 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 (UN Manual X 1983)

In this study the north family model life tables were used because they were found to be suitable for Uganda. The Brass procedure also allows for the estimation of the reference period which mortality estimates SHSSPS data set had. This is 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;

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

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

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

$$Z = \beta_0 + \beta_1\chi_1 + \beta_2\chi_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \beta_p\beta_p \ldots\ldots\ldots (3)$$

β_1 = are the coefficients

χ_1 = 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 and household structure and mothers characteristics.

Results

Percentage Distribution of Respondents by Household type

The results of the analysis in are presented in Table 1. The table shows most of the respondents were from rural areas irrespective of whether the household was nucleated (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 58.6% and 64.1% 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 (42.8%) more than extended households (29%).

Mortality differentials by Household Characteristics using Brass Techniques

Mortality differentials by household characteristics are presented in Table 2. Table 2 shows the highest mortality rates were recorded in extended households ranging from as high as 114 deaths per 1000 live births for under-five 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 contrary to what has been found in most studies (Rutaremwa, 1995, Amouzou and Hill 2004, Amankwaa et al 2003). For instance nationally, Infant and Child mortality rates were to be higher in the rural and the urban areas in the 2002 Housing and population census and previous Demographic and Health Surveys (UBOS and Macro international , 2007, Republic of Uganda 1995 a, 2004 b).

Not surprisingly, large households had higher infant and child mortality rates thatn medium and small households. This is because large households share facilities more likely than smaller ones.

Child survival status by household characteristics

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 child death was significant (p=0.014). This is an expected result since people in nucleated households can have access to the meager necessities compared to 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 (Gribble et al 1993, Adgboyega et al 1997). However, the results in table 3 do not show persistent pattern and do 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 (Mosley and Chen 1984). 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%). May be the so called protected wells and piped water are not safe.

Environment and sanitation factors like type of toilet have also been found to have an effect on child Mortality (Argeseanu, 2004). As expected the table shows that children in households without toilet facility died more (33%). However the difference is not significant (p=0.511).

Percentage of children who died by respondents socio-demographic characteristics

Results of the Bivariate analysis between child survival and socio-demographic characteristics of its mother are showed in table 4. In the table it can be seen that mothers education increases with increasing child survival and the association between the two variables is significant (p=0.000). Secondly, child survival is significantly associated with religion. The children of Muslims die most (42%) compared with Catholics (34%), Protestants (30%) and other religions (28%). Thirdly the higher the number of children ever born to a woman, the higher the chances of child deaths with significant association (p=0.000). Fourthly woman's age increase reduces the chances of child survival (p=0.000). Fifthly, although the association is not significant (p=0.09), urban residence attracts more child survival than rural residence.

Findings from regression analysis of household characteristics and child mortality are presented in table 5. Findings 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. Furthermore, 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 5 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 5 indicates no significant relationship between type of toilet facility, place or residence and household type.

Discussion

It is not surprising that mothers' characteristics were found to be significantly associated with whether a child that was born alive had died or later died. Characteristics of the mother found to be associated with child survival at Bivariate analysis 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 (1984). This further explains the direct impact some of the 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 were more likely to die than their counter parts. This is so true given the socio-economic constraints of large households (Bongaarts, 2001). 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 a child born in a nucleated household was more likely to survive. Explanations for high mortality risks among children ever born to mothers with high parity could be that many children born in a household strain the available resources thus determine the allocation of necessities to all members of the household (Davis and Blake 1956, Bronte-Tinkew, 1992). It is possible that some members of the households are not adequately catered for incase of scarcity and these are likely to be children.

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 Macassa et al 2003 and Davanzo, 1984 who examined the contribution of household environment to urban childhood mortality. These found out 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.

Recommendations

Basing on the findings of this study, it is imperative that the government together with other development partners, including policy makers, programme managers 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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Table 1: Percent Distributions of selected background characteristics of the respondents by household type

Household characteristics	Household type		Total
	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 facility			
Type of Toilet Facility	95.3	95.5	4637
Pit latrine	4.7	4.5	226
No facility			
Total (N)=4863	4643	220	

Table 2 Mortality Differentials by selected household characteristics (per 1000 live births)

Household characteristics	Infant mortality 1q0	Child mortality 4q0	Under-five mortality 5q0
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: Characteristics of the households by survival status of a child

Household Characteristics	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	

Table 4: Socio-demographic characteristics of respondents by child survival status

Household Characteristics	**Child died Yes (%)**	**Total N=4160**
Place of residence		
Urban	28.0	268
Rural	33.1	3901
Chi-square= 2.943	p= 0.086	
Educational Level		
Never attended	41.0	1339
Primary	30.0	2456
Secondary +	20.9	374
Chi-square=73.557	p=0.000	
Religion		
Catholic	33.8	2153
Protestant	30.1	1272
Muslim	41.6	253
Other	27.6	391
Chi-square= 21.683	p=0.000	
Children Ever Born		
1-3	16.0	1693
4-6	34.2	1548
7+	64.0	847
Chi-square=591.511	p=0.000	
Age		
19-24	18.6	1038
25-34	30.9	1721
35+	45.8	1337
Chi-square= 201.503	p=0.000	

Table 5: Logistic Regression of factors affecting child mortality at the household level

Household Characteristics	Odds Ratio	Z	P value
Household type			
Nuclear ***	1.000		
Extended	0.475	-1.67	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 Facility			
Flush/VIP latrine****	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 Ever born			
1-3 ****	1.000		
4-6	2.827	7.58	0.000
7+	10.189	14.41	0.000

Note:

****** =Reference Category**

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