Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.3, No.17, 2013

The Effect of Household Characteristics on Child Mortality in Ghana

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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 Ghana. Ghana's under-five mortality rate stands at 82 deaths per 1000 live births and infant mortality rate of about 53 deaths per 1000 which is far above the world's average in 2006 of 52 deaths per 1000 live births (GSS, MICS 2011). Again, according to (IGME 2012 report) in the 2011 under-five mortality league, Ghana is ranked 34 among 195 countries with child mortality rate of 78 per 1000. (Number 1 being the highest and 195 being the lowest in terms of child mortality). In order to address this problem, the authors used survey data on 4169 women respondents drawn from the 10 administrative regions of Ghana. 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. Of the 1411 women who gave birth during the survey period about (295) 20.9% had given birth who later died. Findings show wide mortality differentials by Mothers' age, mothers' educational levels, place of residence, and household size. Breastfeeding, children ever born, material used for floor of the dwellings and region of residence were the four major variables highly associated with child mortality. The study concludes that household structure, source of drinking water and toilet facilities used were 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, exclusive breastfeeding 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, Ghana

1. Introduction

It has been 13 years since world leaders committed to Millennium Development Goal 4 (MDG 4), which sets out to reduce the under-five mortality rate by two-thirds between 1990 and 2015. Only two years remain before the 2015 deadline. The world has made substantial progress, reducing the under-five mortality rate 41 percent, from 87 (85, 89) deaths per 1,000 live births in 1990 to 51 (51, 55) in 2011. However, this progress has not been enough, and the target risks being missed at the global level. The global under-five mortality rate needs to be reduced to 29 deaths per 1,000 live births—which implies an annual rate of reduction of 14.2 percent for 2011–2015, much higher than the 2.5 percent achieved over 1990–2011. (UN Inter-agency Group for Child Mortality Estimation Report 2012)

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 (UNICEF 2001). According to under-five mortality estimates in the world, Ghana was ranked 143rd among 188 countries with a rate of 78 deaths per 1000 live births (UNICEF 2012). The rates are similar to the current Ghana Multiple Indicator Cluster Survey (MICS) estimates of 2011 which indicated that about 82 children out of 1,000 live births die before their fifth birthday (which means that one in every 12 children die before reaching his/her fifth birthday) while 53 infants out of 1,000 die before their first birthday (GSS MICS 2011). The reference point for this figure was mid-March 2009. The 2010 and 2011 rates are however 80 and 78 respectively (UNICEF 2012). Given the prevailing country's mortality rates, the 2015 Millennium Development Goals is unattainable (GSS MICS 2011, UN 2012). 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 diarrhoea (UNICEF 2001, UNICEF 2012, Rutaremwa G 2012).

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 (UBOS et al 2007, Bryce R et al 2005, Houweling J et al 2005). 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 a country (Bongaarts J 2001, Nakiyingi J 1997). In Ghana the average size per household is four people and it varies across all the ten regions as well as in urban and rural areas (GSS 2010 PHC, 2000 PHC). In most cases the size and composition of households depends on the demographic, social, cultural and economic conditions in

a respective area (Masin E et al 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 J 2001, Kalipeni E 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 (Davanzo J 1984, Lloyd C 1995). Bronte-Tinkew and Hewett in 2004 examined the link between household structure, household economic status, and child wellbeing 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 household characteristics. This paper examined the relationship between child mortality and household characteristics in all the ten regions of Ghana.

2. Data

The 2011 Multiple Indicator Cluster Survey (MICS) data was used in this study. This is a fourth round of the survey which is conducted every five years to monitor the situation of children and women in Ghana. In this survey about 10,963 women who were within the reproductive age (15 – 49 years) were selected across the ten Regions of Ghana. The subjects were interviewed reference to two years preceding the survey. The selection procedure was based on a representative probability sample of households nationwide from a frame of Ghana 2010 Population and Housing Census Enumeration Areas (EA's). For comparability, the MICS used an internationally standardized sampling of two-stage stratified sample design. At the first stage, a number of EA's were selected from the regions which were considered as clusters. The households in each region were then selected using systematic sampling with probability proportional to size in the second stage. Of the 12,150 households selected for the sample, 11, 925 households were contacted and duly interviewed. In the households interviewed, 10,963 women aged 15 – 49 years were identified for interview.

3. Methodology

This paper uses a data set based on the 2011 MICS. The survey was carried out on a sample of 11,925 households from a selected household of 11,970 in all the ten administrative regions of Ghana giving about 100% response rate. The households were selected due to the sizes of the regions. The survey used both qualitative and quantitative methods of data collection aimed at providing basic data for measuring the progress of children and women in the country. Data used for analysis in this paper was based on information on all births and deaths that had occurred two years prior to the survey period. Statistical package for social scientists (SPSS version 17) and SAS system version 9.2 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, area of residence, type of toilet facility, source of drinking water and mothers' characteristics including; education, breastfeeding and age. A critical level of significance of 5 percent ($p<0.05$) 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 regions. Indirect techniques of childhood mortality estimation based on the Brass type of indirect procedures (UN 1983) were employed to estimate the probabilities of dying for children in the various regions. Mortality estimates and differentials studied herein are for the study areas not by regions. The procedure employed is expressed as follows:

$$ {}_nqx = k_i{}^*D_i \qquad \textbf{(1)} $$

Where, ${}_nqx$ 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 (Kalipeni E 1995).

Furthermore, the north family model life tables were used because they were found to be suitable for Ghana. The Brass procedure used herein allows for the estimation of the reference period which mortality estimates MICS 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;

$$ P(\pi) = \frac{\ell^z}{1+\ell^z} \qquad (2) $$

Where P(π) = the probability of an event occurring
Z = is the linear combination of independent variables and is expressed as;

$$Z=\beta_0 +\beta_1X_1 + \beta_2X_2 + \ldots + \beta_iX_j \quad (3)$$

β_i = are the coefficients
Xs = are the independent variables 95% confidence interval and 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.

4. Results

Table 1 shows the descriptive statistics about the households. The table depicts that the risk of child mortality is high in the northern sector of the country than in the southern sector. The situation is however serious in the three northern regions (> 30%) than any other regions in the country. A child born in the Eastern region has a greater chance (83.6%) of surviving the first five years of birth than a child born in any other region in the country. However, the same child born in the Upper East region has only about (66.4%) of surviving. Children born in rural areas also have a higher risk of surviving their fifth year as against their counterparts born in the urban areas (26.1% versus 23.1%). The percentage of under-five mortality observed among mothers who had no education or educated up to only primary level (25% and 23.3% respectively) were higher than those who had post-secondary or tertiary education (4% and 3.9% respectively). The risk of child mortality among women who did not receive antenatal care services at least once was quite higher than those who received antenatal care services (47.1% versus 29.8%). The effect of breastfeeding on child mortality is quite alarming. Women who never breastfed their babies are more disadvantaged of losing their babies before age 5 than those who breastfeed their babies (94.3% versus 29.6%). This stands to reason that 9 in ten children who are not breastfed are likely to die before reaching age 5 whilst about 3 in ten of them are likely to die before reaching age 5 in the case of those who go through breastfeeding.

Table 1 Characteristics of the households by survival status of a child

	Ever had child who later died		**Total**
Variable	**Yes No. (%)**	**No No. (%)**	**No. (%)**
Region			
Western	142 (19.1)	603 (80.9)	745 (100.0)
Central	376 (19.2)	1587 (80.8)	1963 (100.0)
Greater Accra	166 (16.9)	817 (83.1)	983 (100.0)
Volta	134 (17.4)	638 (82.6)	772 (100.0)
Eastern	125 (16.4)	635 (83.6)	760 (100.0)
Ashanti	221 (23.1)	737 (76.9)	958 (100.0)
Brong Ahafo	265 (34.8)	496 (65.2)	761 (100.0)
Northern	633 (32.8)	1297 (67.2)	1930 (100.0)
Upper East	487 (33.6)	964 (66.4)	1451 (100.0)
Upper West	92 (30.3)	212 (69.7)	304 (100.0)
Total	***2641 (24.9)***	***7986 (75.1)***	***10627 (100.0)***
Residence			
Urban	1033 (23.1)	3440 (76.9)	4473 (100.0)
Rural	1608 (26.1)	4546 (73.9)	6154 (100.0)
Total	***2641 (24.9)***	***7986 (75.1)***	***10627 (100.0)***
Mothers' educational level			
Pre school	4 (25.0)	12 (75.0)	16 (100.0)
Primary	450 (23.3)	1482 (76.7)	1932 (100.0)
Middle/ JSS/ JHS	412 (12.4)	2915 (87.6)	3327 (100.0)

Secondary/SSS/SHS	47 (5.3)	843 (94.7)	890 (100.0)
Voc/ Comm/Tech	16 (9.0)	162 (91.0)	178 (100.0)
Post-Secondary (Nursing/ Teacher Training)	4 (4.0)	95 (96.0)	99 (100.0)
Tertiary	10 (3.9)	246 (96.1)	256 (100.0)
Total	***943 (14.1)***	***5755 (85.9)***	***6698 (100.0)***
Antenatal care			
Attended	826 (29.8)	1945 (70.2)	2771 (100.0)
Did not attend	48 (47.1)	54 (52.9)	102 (100.0)
Total	**874 (30.4)**	**1999 (69.6)**	**2873 (100.0)**
Breastfeeding			
Yes	841 (29.6)	1997 (70.4)	2838 (100.0)
No	33 (94.3)	2 (5.7)	35 (100.0)
Total	***874 (30.4)***	***1999 (69.6)***	***2873 (100.0)***
Children ever born			
1	72 (5.8)	1163 (94.2)	1235 (100.0)
2	155 (13.1)	1024 (86.9)	1179 (100.0)
3	246 (21.2)	914 (78.8)	1160 (100.0)
4	354 (31.9)	754 (68.1)	1108 (100.0)
5	423 (42.4)	575 (57.6)	998 (100.0)
6	452 (58.1)	326 (41.9)	778 (100.0)
7	362 (68.4)	167 (31.6)	529 (100.0)
8	267 (75.0)	89 (25.0)	356 (100.0)
9	168 (88.4)	22 (11.6)	190 (100.0)
10	94 (88.7)	12 (11.3)	106 (100.0)
11	29 (80.6)	7 (19.4)	36 (100.0)
12	11 (91.7)	1 (8.3)	12 (100.0)
13	6 (85.7)	1 (14.3)	7 (100.0)
14	1 (100.0)	0 (0.0)	1 (100.0)
16	1 (100.0)	0 (0.0)	1 (100.0)
Total	***2641 (24.9)***	***7986 (75.1)***	***10627 (100.0)***
Main material of floor			
Natural Floor Earth / sand	392 (27.1)	1056 (72.9)	1448 (100.0)
Wood planks	8 (17.8)	37 (82.2)	45 (100.0)
Stone	0 (0.0)	10 (100.0)	10 (100.0)
Parquet or polished wood	0 (0.0)	1 (100.0)	1 (100.0)
Vinyl /Asphalt strips	7 (19.4)	29 (80.6)	36 (100.0)
Ceramic tiles/ marble tiles/ porcelain	40 (19.8)	162 (80.2)	202 (100.0)
Cement/ Concrete	2109 (24.7)	6427 (75.3)	8536 (100.0)
Terrazzo	26 (19.8)	105 (80.2)	131 (100.0)
Burnt Bricks	0 (0.0)	1 (100.0)	1 (100.0)
Other	0 (0.0)	2 (100.0)	2 (100.0)
Total	***2582 (24.8)***	***7830 (75.2)***	***10412 (100.0)***

Table 2 Multiple Logistic Regression Model

Parameter	Hypothesis Test						95% C.I for EXP(B)	
	B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
Constant	7.432	1.200	38.377	1	.000	1689.199	-	-
Area/Residence	.081	.168	.232	1	.630	1.084	.780	1.506
Region	-.079	.035	5.105	1	.024	.924	.862	.990
Religion of household head	.003	.004	.621	1	.431	1.003	.995	1.011
Ethnicity of household head	-.006	.010	.417	1	.518	.994	.975	1.013
Main material of floor	-.028	.012	5.775	1	.016	.9720	.950	.995
Mothers age	.035	.018	3.634	1	.057	1.035	.999	1.073
Mothers education	.111	.093	1.439	1	.230	1.118	.932	1.340
Children Ever Born	-.651	.061	112.320	1	.000	.522	.462	.588
Antenatal care	.643	.565	1.297	1	.255	1.903	.629	5.758
Breastfeeding	-4.641	.826	31.545	1	.000	.010	.002	.049
Marital status	-.096	.123	.617	1	.432	.908	.714	1.155
Household size	-.017	.029	.328	1	.567	.983	.928	1.042
Health insurance	.176	.200	.780	1	.377	1.193	.806	1.765
Type of toilet facility	.004	.003	1.829	1	.176	1.004	.998	1.009
Source of drinking water	.002	.003	.743	1	.389	1.002	.997	1.007

Findings from regression analysis of household characteristics and child mortality are presented in Table 2. Results show that belonging to a particular region in Ghana has an influence on children mortality. Children from the three northern regions have high risk of dying relative to those in the southern sector (p-value=0.024). Among the household living conditions studied, material used for the dwelling floor was found to have effect on mortality (p-value=0.016). Additionally, the results provide a highly significance between mortality and children ever born (p-value=0.000). This means that women who give birth to more children are likely to experience child mortality than those who give birth to few children. Breastfeeding is also found to be highly associated with mortality (p-value=0.000). Women who do not breastfeed their children stands a higher risk of losing their children than those who breastfeed them. Household composition though not significant, suggests that the larger the household size the higher the risk of dying for the children. Among the household living conditions studied, material used for the floor of dwelling was found to be associated with child mortality.

The findings in Table 1 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 in Table 2 indicates no significant relationship between type of toilet facility, place or residence, household size and composition of household members.

5. 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; type of material used on floor of the dwelling, breastfeeding, region, 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 (UBOS et al 2007, Bryce, R.E et al 2005, Mosley W et al 1984). This further explains the direct impact of some back ground characteristics of mother have on her child's survival status. Indeed parity plays a significant role in child survival status in that children born by mothers who already have more children were more likely to die than their counterparts. This is so true given the socio-economic constraints of large households (Bongaarts J 2001). This was also confirmed with the mortality estimates generated using Brass techniques which presented children born by mothers who have high parity rate having a high risk of death. There were mortality differentials recorded among religious affiliation of household head, sex of household head, education, household size, type of toilet facility used and ethnicity. 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 (Davanzo J 1984, Macassa B, et al 2003) who examined the contribution of household environment to urban childhood mortality. They found that children whose mothers lived in households with no toilet facility as well as source of drinking water had a high risk of dying compared to their counterparts. This however confirms a similar study undertaken by (Allen K. et al 2013) in Uganda.

6. Conclusion

Attaining the anticipated 2015 Millennium Development Goal 4 is highly 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 mother's age, place/region of residence, and household size. Breastfeeding, material of the floor and children ever born were the three 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 below the age of 24 and above 35 years and its consequences on children. People should also be sensitized and encouraged to have few people in the households. Exclusive breastfeeding exercise that was started by Ghana Health Service must be given a further boost. This is further linked with antenatal care services hence pregnant mothers should be educated on the need for antenatal and post natal care services in order that they can appreciate the need for exclusive breastfeeding. The government should further elevate mothers economically so that they can provide the basic requirements for their children. The ministries of Work & Housing and Health should come together and come up with appropriate material that can be used by estate developers in the floors of our dwellings.

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