Socio – Economic Factors Affecting Under Five Mortality in South Africa – An Investigative Study

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Abstract
The levels of infant and child mortality are the two sensitive and widely used indicators of socio-economic development. The child mortality rate is a refined and sensitive index of the total cultural milieu of a community or a country. It reflects among other things, the state of public health and hygiene, the environmental sanitation, cultural mores about feeding and clothing, socio-economic development, and above all, the people's attitude towards the dignity and value of human life itself. It is the simple statistical index which conveys the idea of whether environmental hazards, including contagious diseases, ebola, cholera, etc. are controlled effectively or not in the less developed countries, especially in Africa. The under five mortality situation in South Africa has been investigated in this research using South African Demographic and Health Survey data. About ten socio-economic, demographic, environmental and health-related variables were analyzed using categorical data modeling (catmod) analysis. On the basis of the analyses, the study concludes that education of both parents, marital status of the mother as well as her occupation, the loss of older children previously and the duration of breastfeeding, are the factors affecting under five mortality in South Africa.

INTRODUCTION

The levels of mortality, especially child or under five mortality reflect the state of public health and hygiene, the environmental sanitation, cultural mores about feeding and clothing, socio-economic development, and above all, the people's attitude towards the dignity and value of human life itself (Bawah, 2001). The child mortality level is the simple statistical index which conveys the idea of whether environmental hazards, including contagious diseases, ebola, cholera, etc. are controlled effectively or not in the less developed countries. The child mortality level can be used for strategic and national planning as well as a measure of socio-indicators like the quality of health care, nutrition, family planning practice and usage. The level provides evidence of policies and practices which lead to the improvement of health conditions (Cook *et al.* 2009). Environmental factors such as sanitation and accidents in and around the home are also reflected in the rate of child mortality. [In this study child mortality is taken to mean under five mortality, that is, zero to five years.]

High Child mortality as a problem to both society and family
Child mortality poses problem to both society and the family. High child mortality levels are a signal that basic health infrastructure to fight poor sanitation, environmental degradation and living condition are grossly inadequate. Besides, they reveal that other basic facilities are absent or are in a poor state, for example, toilet facilities, water, sewerage and the rest. Where high child mortality is prevalent there is equally a display of infectious and parasitic diseases. This is an indication of poor hygienic conditions and frequent outbreak of epidemic diseases. In most African countries, especially among the rural people, high child mortality sometimes results in a breakdown of marriages because many reasons are read into the "misfortune". When couples lose more than one infant (normally the first born), speculations become rife as to whether one of the families does not practice witchcraft which results in the death of the infant(s). In a polygamous marriages, if one of the women should suffer this fate, all sorts of accusations are leveled against her and her parents by her rival(s). The end product is that her marriage would be unhappy, to say the least.

Frequent child loss in many African countries causes, in many cases, the couple to lose their "Christian beliefs and values" because of the attitude the society shows to them. Because such families are frowned upon and despised, they end up consulting all sorts of mediums to find out what has gone wrong with them. Consequently they no longer believe in the all-knowing God, but rather look up to other gods for solutions and/or for fortune. In most African societies, frequent infant and child deaths, and/or sterility are seen as bad omen. Parents are viewed as having been cursed for their unproven wrong deeds (Adansi-Pipim, 1985). In short, child mortality brings

sorrow, pain, despise and lack of respect to the family. It brings pain to the couple, the families and even the society at large.

METHODOLOGY
This study uses South African Demographic and Health Survey Data for the African population because Mostert (no date) has said that there is lack of reliable data on mortality in general and childhood mortality in particular on the black population.

About 14 independent variables (5 variables being socio-economic indicators, 4 environmental variables, 2 demographic variables, 2 health-related variables and one nutritional variable) were investigated with the view of determining whether they affect child mortality. The variables are:

$X1$ = Under five mortality (dependent variable);
$X2$ = ANCHUP = ante-natal medical check-up;
$X3$ = MEDUC= education of mother;
$X4$ = MOCCUP = occupation of mother;
$X5$ = MHSCH = number of children born to mother;
$X6$ = survival of penultimate child;
$X6B$= M2CH= a loss of an older child;
$X7$ = MSTAT= marital status of mother;
$X8$ = TYDW= type of dwelling;
$X9$=OCCUPF= occupation of the husband/partner;
$X10$=EDUCF= education of husband/partner;
$X11$= WATER= availability of water in residence;
$X12$= TOILET= availability of toilet in residence;
$X13$= VACCH= vaccination of children;
$X14$ = DBRFED= duration of breastfeeding.

Both chi-square test and categorical modeling analysis (catmod analysis) were applied in this study. After doing a bivariate analysis of under five mortality and each of the 14 independent variables four of the independent variables were eliminated because the ensuing chi-square tests showed that those variables did not have significant relationship with child mortality. Ten models were constructed in the investigation of under five mortality. Seven of the ten models have four variables each while three of the models have three variables. The seven models (3, 5-10) with four variables each were modeled with three variables remaining constant while the fourth variable changed step-wisely. That is, the variables, education of the mother, marital status and the number of children born to the woman remain constant. In the remaining three out of the ten models, (models 1, 2 and 4) with three variables, two out of the three variables remain constant. They are the education of the mother and the marital status of the mother.

Below are the description of the variables in the model:
- Model 1, education of the mother, marital status of the mother and the number of children born to the mother;

- Model 2, education of the mother, marital status of the mother and a loss of an older sibling by the mother (the survival of a penultimate child);
- Model 3, education of the mother, marital status of the mother, the number of children the mother has and occupation of the father;
- Model 4, education of the mother, marital status of the mother and occupation of the mother;
- Model 5, education of the mother, marital status of the mother, the number of children the mother has and a previous loss of a child by the mother (the survival of a penultimate child);
- Model 6, education of the mother, marital status of the mother, the number of children the mother has and the duration of the breastfeeding;
- Model 7, education of the mother, marital status of the mother, the number of children the mother has and ante-natal medical check-up;
- Model 8, education of the mother, marital status of the mother, the number of children the mother has and education of the father;
- Model 9, education of the mother, marital status of the mother, the number of children the mother has and availability of a toilet in the house; and
- Model 10, education of the mother, marital status of the mother, the number of children the mother has and vaccination of the child.

Theoretical importance of the variables in the model and the problems associated with the choice and quantification of the variables

There is a lot of literature supporting the fact that each of the socio-economic variables (education, occupation, income, marital status, etc.) considered here affects infant and child mortality (see Caldwell, 1979, 1986; Tekce & Shorter, 1984; Behm,1986; Ruzicka *et al.* 1989; Behm & Soto, 1991). The variables are considered here in order to test whether what is known to be true in other places is equally true or not in South Africa. For example, education of the mother has often been treated as a proxy for socio-economic status, yet many studies including that of Caldwell (1979) have argued that the education of the mother has a more direct effect on child mortality through improved health care (see also Hobcraft *et al.,* 1984; Ebigbola, 1999).

The work status of a mother is an important determinant of mortality of her children at the younger ages, zero to five. The need to work, especially outside the home, may affect survival chances directly by preventing the mother from caring for the child (Tawiah, 1979). This may have substantial effects through a lack of proper feeding and particularly, the lack of breastfeeding in early life. However, work outside the home is likely associated both with modernity and with higher family income, both of which will probably increase the children's chances of survival. In South Africa a number of working women are domestic

workers/maids/helpers who do not stay with their children. Unfortunately, their income/wages are too low to compensate for their absence from home. Thus their absence from home tends to have a negative effect on the health of their young children.

The occupation of the mother and/or her husband/partner is important, but the income received is the most important factor. The amount of money received determines how the family is able to cope with their basic needs. Because there is no information about income, the occupation of the parents, especially that of the husband/partner/father, has been taken as a proxy for the family's income. A partner who is a technician or a high school teacher or a supervisor is considered to have a better income than a sales attendant, laborer or a farm worker, but occupation as a concept presents a problem because it is very difficult to define in the African context. Most black people work in the informal sector, and because they do not get regular wages, they do declare themselves as not working (unemployed or without occupation). Besides, the occupation of the current husband/partner does not necessarily refer to the partner at the time of the birth or at the death of the child (if any death has occurred). In short, the collection of information on occupation is fraught with difficulty.

Primary health care and health education are equally important factors affecting infant and child mortality. The longer the duration of breastfeeding (more than twenty months) the lower the risk of child mortality (Kyei,1999). The frequency of ante-natal medical check-ups increases the chances of safe delivery. It reduces the danger facing the mother or child who is suffering from anemia, which lacks iodine, calcium or iron; because some treatment can be given before the situation deteriorates. It is a means to 'correct' low- or under- weight problems of un-born babies as well as a means to improve the mother and the un-born baby's health. Any sickness which otherwise might have threatened the life of both the mother and the child could be treated during pregnancy. The vaccination of children reduces the risk of death through measles, polio, tetanus, and other deadly diseases and epidemics.

Many studies confirm that the variables like 'age of the mother', 'birth order', and 'the interval between successive births' affect infant and child mortality (see for example, Venkatacharya,1991; Arriaga, 1989; Nyarko et al., 1999). When a woman is too young (less than 20 years) or too old (older than 40 years), the risk of child mortality is high. Similarly, children born with an interval less than two years, have a higher risk of death than those born with an interval more than two years, controlling all other factors (Rossouw & Hofmeyr, 1990). The most frequent demographic variables used besides the age

of mother at birth, are: the birth order (parity) and the interval between successive births. But because these variables are not included in the questionnaire, they have been replaced by the number of children born to the mother (the family size). This choice seems to be a good substitute because a large family size, for example, would imply a short birth interval, as well as a high order of parity.

Categorical Data Modeling Procedure
The Categorical Data Modeling (catmod) is a procedure that fits linear models to functions of response frequencies and can be used for linear modeling, log-linear modeling and logistic regression. Catmod fits linear models to categorical data, facilitating such analyses as regression, analysis of variance and repeated measurement analysis. It uses maximum likelihood estimation of parameters for log-linear models and the analysis of general logits, uses weight-least squares estimation of parameters for a wide range of general linear models. The method of maximum likelihood consists of maximizing the likelihood function with respect to the parameter, that is the estimator. A likelihood ratio test states that the null hypothesis H_o is rejected if and only if the ratio λ, falls in a critical region of the form $\lambda \leq k$, where $0 < k < 1$. The catmod procedure is more flexible and more informative than other linear regression function procedure like gencat and funcat, for example, because there are numerous design features with catmod that make that possible (SAS, 1985).

RESULTS AND INTERPRETATIONS
The bivariate analysis shows that, on the basis of chi-square test, ten out of the fourteen independent variables influence under five mortality. These, as we can see from the table below, are:

- The education of the mother,
- The occupation of the mother,
- The number of children born to the mother,
- A previous loss of child by the mother
- The marital status of the mother,
- The presence of a rival to the mother,
- The occupation of the father/husband (household income)
- The education of the father,
- The duration of breastfeeding, and
- The vaccination of children against certain diseases.

While the socio-economic, demographic and health variables in the model prove to be important factors affecting under five mortality, it is surprising to note that none of the environmental variables (the type of dwelling, water in residence, and toilet in the residence) included in the model, showed to be an important determinant of under five mortality.

Table 1: The test for the relationship between under five mortality and independent variables

Dependent variable	Mortality	Independent variables	Sample size	Prob.
X1	Under five	X3=MEDUC	5941	0,000
		X4=MOCCUP	6867	0,000
		X5=MHSCH	7286	0,000
		X6=M2CH	7286	0,000
		X7=MSTAT	7284	0,000
		X7B=MHSRI	4999	0,000
		X9=OCCUPF	5751	0,011
		X10=EDUCF	4542	0,002
		X14=DBRFED	2039	0,002
		X13=VACCH	5136	0,070

Source: SADHS data

Catmod Procedure for the Analysis of Factors Affecting Under Five Mortality

Table 2 below shows that in model 1, all the three variables in the model, education of the mother, marital status of the mother and the number of children that she has (children born to the mother) have a highly significant relationship with under five mortality. In model 2, by replacing the variable, number of children the mother has, by the variable, the loss of an older child, the latter variable now becomes the most important determinant of under five mortality. The addition of this variable has "destroyed" the relationship that existed between marital status of the mother and under five mortality.

In model 3, the variable, occupation of the father which was added to the variables in model 1, showed no relationship with under five mortality. However, replacing the variable, occupation of the father by that of the mother in model 4, gives a different result. All the four variables in model 4 are important determinants of under five mortality.

In model 5, the variable, a loss of an older child was added to the variables in model 1. The result shows that this variable has a highly significant relationship with under five mortality. What is more, the relationship between the three variables in model 1 with under five mortality weakens in the presence of this additional variable. The two variables, education of the mother and the number of children the mother has, have lost the very significant relationship they had with under five mortality in model 1, completely. The relationship between the marital status of the woman and under five mortality has become marginally significant. The overall likelihood ratio however, shows that all the four variables are strong determinants of under five mortality.

Similarly, in model 6, the addition of the variable, duration of breastfeeding to the three variables in model 1, weakens the relationship between under five mortality on the one hand, and education of the mother and the marital status of the mother, on the other. The significant relationship between the number of children born to the mother (the number of children the mother has) and under five mortality disappears completely. However, the relationship between marital status of the mother and education of the mother, on the one hand, and under five mortality, on the other hand, remains significant. Particularly, the relationship between marital status and under five mortality remains significant. The results further show that the fourth variable, duration of breastfeeding, has a very strong relationship with under five mortality.

In model 7, when the variable, ante-natal medical check-up was added to the variables in model 1, the highly significant relationship that the variables in mode 1 had with under five mortality weakened. The number of children the woman has, lost is significant relationship. The added variable, ante-natal medical check-up, itself did not show to be a determinant of under five mortality.

In model 8, the variable, education of the father, per se, did not show to have a significant relationship with under five mortality. However, the over all likelihood ratio test shows that all the four variables in the model have a significant relationship with under five mortality, especially at the ten percent level, though.

In model 9, the variable, availability of a toilet in the residence, did not appear to have a significant relationship with under five mortality. Equally in model 10, the variable, vaccination of children, did not seem to have relationship with under five mortality.
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From the ten models, it is clear that the following variables: occupation of the father, ante-natal medical check-up, availability of a toilet in the residence and vaccination of children did not have a significant relationship with the under five mortality. The other variables have proved to be factors affecting the under five mortality. The occupation of the mother is seen to be a weak determinant in the presence of education of mother and her marital status. Similarly the education of the father only becomes a determinant in the presence of other variables like the number children the woman has, her education, and her marital status.

In model 2, once a woman has lost an older child previously, her marital status becomes irrelevant in determining the under five mortality. It equally renders the number of children the woman has and her education unimportant factors (see model 5).

In short, the following variables are determinants of the under five mortality:

- Education of the mother,
- Marital status of the mother,
- The number of children the mother has,
- Duration of breastfeeding,
- A previous loss of a child;

Table 2: Catmod analysis for the factors affecting under five mortality

Model	Mortality	Sources	DF	Chi-square	Prob./ Likelihood ratio
1	Under five	INTERCEPT	1	699,31	0,0000
		X3=MEDUC	1	14,13	0,0000
		X7=MSTAT	2	33,41	0,0000
		X5=MHSCH	2	37,18	0,0000
		L. RATIO	11	19,86	**0,0473**
2	Under five	INTERCEPT	1	264,13	0,0000
		X3=MEDUC	1	2,84	0,0919
		X7=MSTAT	2	4,23	0,1202
		X6B=M2CH	1	55,44	0,0000
		L. RATIO	7	7,96	**0,3365**
3	Under five	INTERCEPT	1	144,91	0,0000
		X3=MEDUC	1	4,26	0,0390
		X7=MSTAT	2	30,38	0,0000
		X9=OCCUPF	4	4,96	0,2919
		X5=MHSCH	2	29,33	0,0000
		L. RATIO	51	57,57	**0,2452**
4	Under five	INTERCEPT	1	967,97	0,0000
		X3=MEDUC	1	29,57	0,0000
		X7=MSTAT	2	20,04	0,0000
		X4=MOCCUP	3	6,89	0,0755
		L. RATIO	17	40,23	**0,0012**
5	Under five	INTERCEPT	1	114,41	0,0000
		X3=MEDUC	1	2,37	0,1237
		X5=MHSCH	2	0,86	0,6511
		X6B=M2CH	1	55,33	0,0000
		X7=MSAT	2	4,74	0,0933
		L. RATIO	57	37,46	**0,0211**
6	Under five	INTERCEPT	1	134,62	0,0000
		X3=MEDUC	1	2,83	0,0925
		X7=MSTAT	2	6,97	0,0306
		X5=MHSCH	2	3,08	0,2140
		X14=DBRFED	4	19,49	0,0006
		L. RATIO	57	46,37	**0,0417**
7	Under five	INTERCEPT	1	230,58	0,0000
		X3=MEDUC	1	6,48	0,0109
		X7=MSTAT	2	8,95	0,0114
		X5=MHSCH	2	2,65	0,2652
		X2=ANCHUP	3	4,19	0,2419
		L. RATIO	45	39,03	**0,7219**
8	Under five	INTERCEPT	1	36,52	0,0000
		X3=MEDUC	1	2,97	0,0847
		X5=MHSCH	2	19,52	0,0001
		X10=EDUCF	2	2,65	0,2658
		X7=MSTAT	2	26,84	0,0000
		L. RATIO	31	43,91	**0,0622**
9	Under five	INTERCEPT	1	336,08	0,0000
		X3=MEDUC	1	10,11	0,0015
		X5=MHSCH	2	22,19	0,0000
		X12=TOILET	1	1,98	0,1596
		X7=MSTAT	2	28,74	0,0000
		L. RATIO	25	33,36	**0,1223**
10	Under five	INTERCEPT	1	308,78	0,0000
		X3=MEDUC	1	12,96	0,0003
		X5=MHSCH	2	63,11	0,0000
		X7=MSTAT	2	7,71	0,0212
		X13=VACCH	2	4,26	0,1188
		L. RATIO	35	38,66	**0,3077**

- Occupation of the mother and
- Education of the father.

The first five are strong determinants, while occupation of mother and education of the father are weak.

CONCLUSION
Even though South African has had a black government for the past sixteen years, a high proportion of the black people do not have homes. They live in shacks in shanty and other places where they battle with social and economic problems, including malnutrition and diseases. Some children lack parental care and good food. Some of the unemployed parents do not have financial means to care for the children. Some children are even abandoned in the street to fend for themselves. This pathetic scene needs proper investigation, strategies and actions to correct and improve the quality of the children's lives.

The results in this study show that the factors affecting the under five mortality are education of the mother, marital status of the mother, the number of children the mother has, duration of breastfeeding, a loss of an older child; and the occupation of the mother. Tawiah has shown that work status of a mother is an important determinant of mortality of her children at the younger ages, zero to five. He explains that when a mother works outside the home, she is prevented from taking maximum care of the child and that affects the survival chances of the child directly (Tawiah, 1979). This study has also supported that assertion. On the other hand, the longer the duration of breastfeeding (from HIV-negative women) the lower the risk of child mortality; the risk reduced by over 33 percent (see Kyei 1999).

Female formal education, especially up to the completion of grade ten, has been noted as important (Caldwell, 1979, 1986; Tekce & Shorter, 1984; Ruzicka et al. 1989). It has been confirmed in this study that women's education after nine-successful-years of schooling is a necessary and essential factor to promote a decline in child mortality. In fact education, especially female education, is an important determinant of employment in Limpopo province in South Africa (Kyei and Gyekye, 2011) because that provides "bread" in the house. The need to encourage female higher education cannot be over emphasized.

Most traditions, including the African tradition, make the married woman subservient to her husband. Some educated women, including graduates with higher degrees from universities, in Africa, still find themselves enslaved by their husbands or traditions, particularly when the question of sex and procreation is discussed (Adewuyi, 1999; Kritz, 1999). Even though most African women desire smaller families,

the actual family size is bigger (Zaky, 1999). Unless a review of the existing traditional practices takes place, as well as the culture turned around, formal education alone will not be able to achieve the family size, and for that matter, the under five mortality level that is desired.

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